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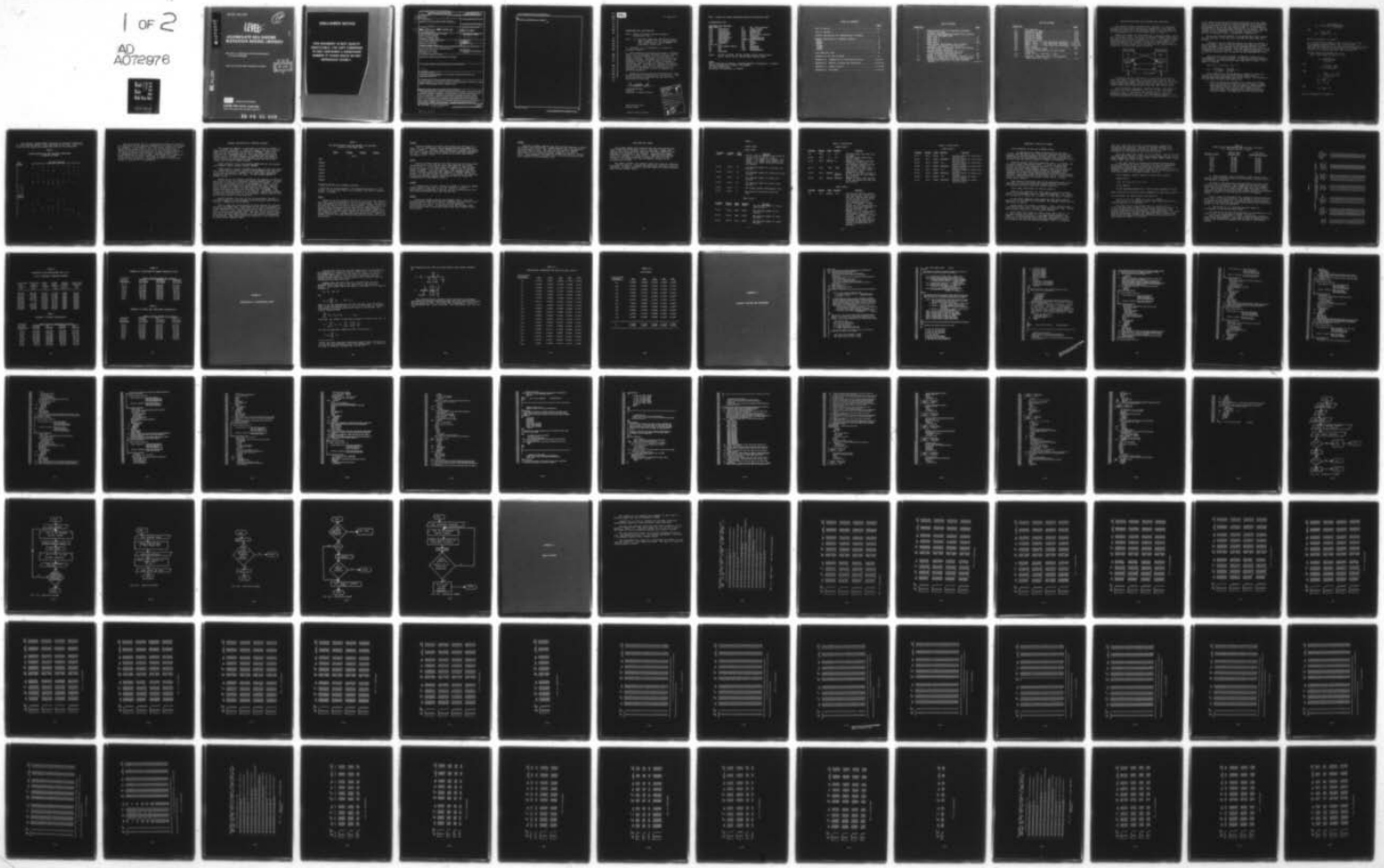

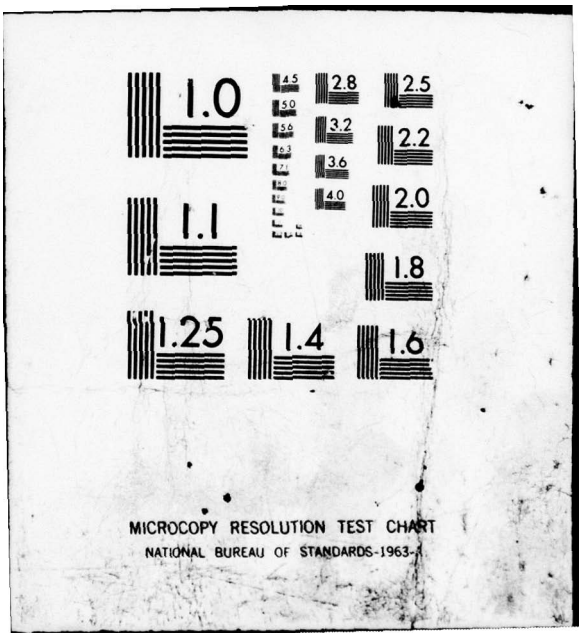
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LEVEL II

AGGREGATE SEA/SHORE ROTATION MODEL (MOSES)

By LCdr. R. J. Waterman, USN; Donald Maurer;
R. LaVar Huntzinger

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This guide describes a model of the relations between lengths of sea and shore tours, continuation behavior of personnel, and the numbers of first-term and career personnel at sea and ashore. Equations are developed to represent sea/shore rotation systems in which the number of persons in each of these four groups remains the same. This mathematical representation (developed further in CNA Professional Paper 256) was programmed for the computer, and the use and operations of the computer routine, MOSES, are treated here. Listings and flowcharts of the main

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routine and subroutines are included.

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1. Enclosure (1) is forwarded as a matter of possible interest.

2. This Research Contribution describes a computer model that interrelates sea/shore rotation, continuation, billet structure, and the enlisted personnel inventory. The model is being used by Navy manpower planners to analyze billet structure and personnel policies to see if they are mutually consistent, and to assess the effects of proposed policy changes. This work is intended for computer programmers charged with the installation and operation of the model, as well as manpower and personnel managers.

3. Research Contributions are distributed for their potential value in other studies and analyses. They do not necessarily represent the opinion of the Department of the Navy.

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PROBLEM DESCRIPTION AND COMPUTATIONAL PROCEDURE

The FORTRAN computer program MOSES implements the aggregate sea/shore rotation model presented in appendix D. This model is designed for analysis of any community whose billets and personnel can be segregated into the four groups shown in figure 1.

These four groups are first-term sea, first-term shore, career sea, and career shore. The flows of personnel between these groups are limited to the paths indicated in figure 1. The bottom arrows represent losses from the career force. The actual number of personnel moving from one category to another is determined by the sea/shore rotation pattern to be followed and the continuation behavior of first-term and career personnel.

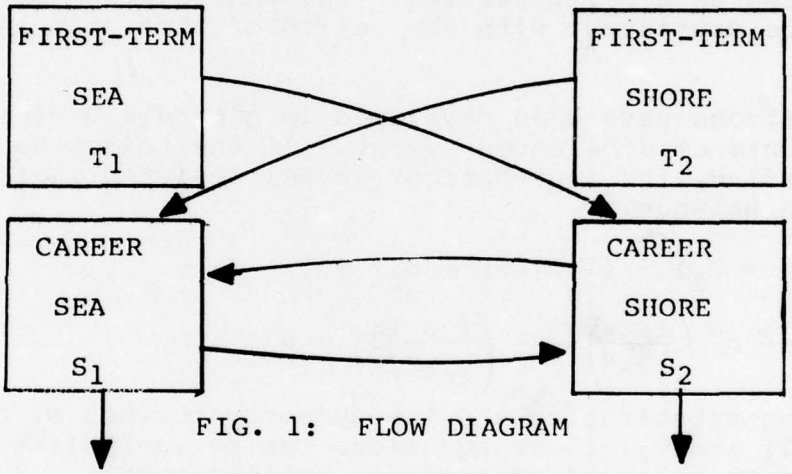

FIG. 1: FLOW DIAGRAM

A balanced system is defined as a steady state structure in which the number of personnel in the four billet groups, and the flows between the groups, remain constant over time. In a balanced system, accessions remain the same each year and manning levels remain steady because gains equal losses for each billet group.

Eight parameters determine a balanced system: the number of billets in the four categories T_1, T_2, S_1, S_2, the first-term transition rate, r, the career continuation rate, c, and the sea/shore rotation pattern, a:b. The continuation behavior of first-term personnel is represented by a single parameter, r, which

is the ratio of the per period flow of personnel into the career force, to the total number of personnel serving their first tour. Continuation behavior for the career categories is represented represented by an average continuation rate, c, which is the percentage of all career personnel retained for one period. The computation of this parameter, from the more familiar length of service continuation rates, is presented in appendix A.

For an a:b rotation pattern it is assumed that career personnel are assigned to sea duty for a periods and shore duty for b periods.

A period of sea or shore duty may be one year, six months, or even one month. Usually rotation patterns are adjusted in three-month increments and a quarter is the standard period. Thus a three-year sea duty/three-year shore duty rotation pattern would be represented as a 12:12 pattern. The continuation parameters, c and r, must be consistent with the period of time selected for a and b.

Equations have been developed in appendix D depicting the requirements of a balanced system. If the following two equations are satisfied, the four-category model depicted in figure 1 will remain in balance:

$$r(T_1 + T_2) - (1-c)(S_1 + S_2) = 0$$

$$rT_1 + c^a\left(\frac{1-c}{1-c^a}\right)S_1 - \left(\frac{1-c}{1-c^b}\right)S_2 = 0$$

Using substitution and the symmetry between S_1 and S_2 and between T_1 and T_2, these equations can be manipulated to produce many balanced systems for various inputs. Two examples of the questions the model now answers are:

1. Given first-term sea billets (T_1), career sea billets (S_1), the first-term transition rate (r) and the career continuation rate (c), for any desired rotation pattern (a:b) how many shore billets, both career (S_2) and first-term (T_2), are required for a balanced sea/shore rotation system? The equations for this solution are:

$$T_2 = -c^b T_1 + \left(\frac{1-c^{a+b}}{r}\right)\left(\frac{1-c}{1-c^a}\right)S_1$$

and

$$S_2 = \frac{r(T_1 + T_2)}{1-c} - S_1$$

This is structure A in table 1.

2. Given the total number of sea billets $(T_1 + S_1)$, the total number of shore billets $(T_2 + S_2)$ and the continuation behaviors (c,r), for each rotation pattern (a:b) what are the sizes of the individual billet groups T_1, T_2, S_1 and S_2 in a balanced system? The solution is:

Let SB = total sea billets $(T_1 + S_1)$
SHB = total shore billets $(T_2 + S_2)$

$$X = \frac{(1-c^{a+b})(1-c)}{r(1-c^a)}$$

and

$$Y = \frac{(1-c)(SB + SHB)}{r + 1 - c}$$

then

$$T_2 = \frac{X(SB - Y) - Yc^b}{1-c^b - X}$$

$$S_2 = SHB - T_2$$

$$T_1 = Y - T_2$$

and

$$S_1 = T_1 S_1 - T$$

This is structure F in table 1.

The computer program MOSES calculates 10 balanced structures for each rotation pattern (a:b) specified by the user. Table 1 is a list of the inputs and outputs for each of the structures.

TABLE 1

INPUTS/OUTPUTS FOR THE BALANCED STRUCTURES COMPUTED BY MOSES

User inputs	Balanced systems									
	A	B	C	D	E	F	G	H	I	J
T_1	*		*					*	*	*
T_2			*	*	=0			*	*	*
S_1	*	*					*	*	*	*
S_2		*								*
c	*	*	*	*	*	*	*	*		
r	*	*	*	*	*	*	*		*	
$T_1 + S_1$				*	*	*				
$T_2 + S_2$						*				
$T_1 + T_2$							*			
Program outputs										
T_1		*		*	*	*	*			
T_2	*	*				*	*			
S_1			*	*	*	*				
S_2	*		*	*	*	*	*	*	*	
c									*	*
r								*		*

The input/output list of 10 balanced structures is certainly not exhaustive of the possible combinations of inputs and outputs. For example, in structures H and I the output variable S_2 could easily change places with T_1, T_2, or S_1 in the input list. Adding to, altering or deleting any of these balanced systems in the computer program would require a change or addition of of approximately 15 lines of code. The program has a subroutine, CHECK, which can be used to determine if added or altered structures are in balance. This aids the user in finding any errors in calculation or programming.

GENERAL DESCRIPTION OF COMPUTER PROGRAM

The program is modular in structure to facilitate changes in logic, options, problems, -- input and output. The main routine MOSES and all subroutines are written in FORTRAN. With minor modifications the program can be run on any sufficiently large computer with a FORTRAN compiler. The subroutines are used as though part of one large program and most of the interchange of values between the subroutines is done through the use of both labeled and unlabeled common regions.

MOSES consists of the main routine MOSES and the five subroutines BALANZ, CHECK, FEASBL, PRINTT, ROTATE.

MOSES reads in control information and data to start the problem. MOSES assigns default values to any parameters not specified by the user and prints a summary of the input data, parameters, tolerances and options to be used. It then invokes BALANZ or ROTATE or both.

ROTATE writes out heading information and computes 10 balanced structures for the first sea/shore rotation pattern (a:b). As each structure is computed, control is transferred to PRINTT. If the option has been selected by the user, PRINTT will call the subroutine FEASBL and FEASBL will determine if this newly computed billet structure is within the user specified tolerances. Only feasible balanced systems will be printed out. If FEASBL is not called, all balanced systems will be printed. ROTATE then computes 10 balanced structures for the next sea/shore rotation pattern with PRINTT being called for each structure.

BALANZ computes, for each of the 10 input/output choices, a balanced system for every sea/shore rotation pattern specified by the user. BALANZ also calls PRINTT.

Table 2 gives the relationships existing between the routines making up the MOSES code. Each column of the table corresponds to a routine/subroutine in the code that calls other routines or functions. The "*" in the column identifies the routine or function that the routine may possibly call. The rows can be used to determine which routines might possibly call the routine corresponding to the column. This table should be consulted if any alterations are made to the computer code.

TABLE 2

THE RELATIONSHIP EXISTING BETWEEN THE ROUTINES MAKING UP THE MOSES CODE

	MOSES	BALANZ	PRINTT	ROTATE
		Calls		
ABS[1]		*		*
BALANZ	*			
CHECK[2]		*	*	*
FEASBL			*	
FLOAT[1]			*	
PRINTT		*		*
ROTATE	*			

[1] This is an intrinsic FORTRAN function.

[2] CHECK may be called whenever a new balanced structure is completed. The user must insert the statement CALL CHECK in BALANZ, PRINTT, or ROTATE.

MOSES

MOSES is the main program routine that initiates the aggregate sea/shore rotation algorithm; it is not a subroutine. The input of data, parameters and options is done in MOSES. Default values are provided for almost all options and parameters although blank cards should always be supplied by the user for all READ statements. Depending upon the input value of the variable ALPHA, MOSES transfers control to BALANZ and/or ROTATE for the actual computation of the balanced billet structures and continuation rates. BALANZ and ROTATE calculate the same balanced structures but group the output differently.

BALANZ

Subroutine BALANZ calculates the outputs for each set of inputs. The 10 input/output relationships evaluated by MOSES are shown in table 1. Choosing input combination A, BALANZ calculates the correct output for each sea/shore rotation pattern selected by the user. BALANZ repeats this operation for each input/output structure A, B, C ... J.

CHECK

Subroutine CHECK computes the flows into and out of the total career force ($S_1 + S_2$) and the gains and losses of the career sea force (S_1). If the gains equal the losses for each of these groups the system is in flow balance. CHECK is not at present called in MOSES. The user must insert the statement CALL CHECK after a balanced system has beem computed in ROTATE, BALANZ, or PRINTT. If the user chooses to insert a new routine for computing an eleventh balanced system, CHECK may be used for detecting computational or programming errors.

FEASBL

If desired by the user, subroutine FEASBL is called by PRINTT. FEASBL checks to see that T_1, T_2, S_1, and S_2 are within user specified tolerances. Only the billet structures which are within these feasible limits are printed out.

PRINTT

Subroutine PRINTT controls the program output. For each balanced system computed by BALANZ or ROTATE, the following values are printed: T_1, T_2, S_1, S_2, C, R, and the sea/shore rotation pattern (a:b). In addition, total sea billets, total shore billets, total first-term billets and total career billets are printed.

ROTATE

Subroutine ROTATE computes the same balanced systems as BALANZ but groups them differently. ROTATE selects the first sea/shore rotation pattern (a:b). For this rotation pattern, ROTATE calculates the 10 billet structures A through J in table 1. Selecting the next rotation pattern, ROTATE calculates A through J again. This procedure continues until 10 billet structures have been computed for each pattern (a:b).

USER-SUPPLIED CARDS

The present MOSES code requires that the user provide four input cards listing between 7 and 26 variables. These cards specify the billet structure inputs to be used by MOSES and the computational strategy to be followed. The user must supply variables 1 through 7 on input card 1. MOSES provides default values for variables 8 through 26 which are input on cards 2 through 4; the program will use the default values for all variables set to zero.

The names, formats, and default values for these 26 variables are listed in table 3. Because the model will run with as few as 7 variables, the READ statements could be removed and DATA statements used for the initial input.

TABLE 3

INPUT CARDS

INPUT CARD 1

Columns	Format	Name	Meaning
1-10	F10.0	ALPHA	Option used to determine the grouping of the printed output. With ALPHA = 0.0, MOSES calls BALANZ. With ALPHA = 1.0, MOSES calls ROTATE. With ALPHA = 2.0, MOSES calls both ROTATE and BALANZ.
11-20	F10.0	T1	The desired number of first-term sea billets.
21-30	F10.0	T2	The desired number of first-term shore billets.
31-40	F10.0	S1	The desired number of career sea billets.
41-50	F10.0	S2	The desired number of career shore billets.
51-60	F10.5	C	The annual career continuation rate.
61-70	F10.5	R	The annual first-term transition rate.

INPUT CARD 2

Columns	Format	Name	Default	Meaning
1-10	F10.0	T1T2	T1+T2	The desired number of first-term billets.
11-20	F10.0	T1S1	T1+S1	The desired number of sea billets.
21-30	F10.0	T2S2	T2+S2	The desired number of shore billets.
31-40	F10.0	S1S2	S1+S2	The desired number of career billets.

TABLE 3 (continued)

INPUT CARD 3

Columns	Format	Name	Default	Meaning
1-9	F9.3	A	3.0	Minimum career sea duty tour in years.
10-18	F9.3	B	2.0	Minimum career shore duty tour in years.
19-24	F6.0	PERIOD	4.	Number of standard rotation intervals in one year. If the standard rotation period is 3 months, PERIOD = 4.
25-32	F8.5	EPS	.0001	Absolute error value used to calculate a correct career continuation rate.
33-38	F6.0	SEATIM	(2. x PERIOD) + 1	Number of sea duty periods to be calculated for each shore duty period.
39-44	F6.0	SHOTIM	PERIOD+1	Number of shore duty periods to be calculated for each sea duty period.

INPUT CARD 4

Columns	Format	Name	Default	Meaning
1-7	F7.3	PERCEN	0.0	The maximum absolute percentage difference, specified by the user, between each group of the present billet structure (T_1,T_2,S_1,S_2) and the computed billet structures. If PERCEN = 0 this option will be ignored and all billet structures computed will be printed. If PERCEN > 0, all billet structures within a $\pm$ PERCEN of the present structure will be printed. If PERCEN = -1 the following eight variables supplied by the user will be utilized to determine which billet structure will be printed.

TABLE 3 (Continued)

INPUT CARD 4

Columns	Format	Name	Default	Meaning
8-15	F8.0	T1MIN	0.0	Minimum number of first-term sea billets.
16-23	F8.0	T1MAX	99999999	Maximum number of first-term sea billets.
24-31	F8.0	T2MIN	0.0	Minimum number of first-term shore billets.
32-39	F8.0	T2MAX	99999999	Maximum number of first-term shore billets.
40-47	F8.0	S1MIN	0.0	Minimum number of career sea billets.
48-55	F8.0	S1MAX	99999999	Maximum number of career sea billets.
56-63	F8.0	S2MIN	0.0	Minimum number of career shore billets.
64-71	F8.0	S2MAX	99999999	Maximum number of career shore billets.

EXAMPLES OF THE USE OF MOSES

Three examples of the use of MOSES follow.

1. In ratings with a heavy concentration of sea duty billets, how many shore duty billets are required for rotational purposes for various sea/shore rotation policies? Knowing the shore duty billet requirements for rotation, how many excess shore billets exist and could be manned by women or civilians?

Using an annual first-term transition rate, r = 0.09345, and an annual career continuation rate, c = 0.86, how many shore billets, S_2 and T_2, are required to rotate T_1 = 144,835 sea billets for first-term personnel and S_1 = 74,612 sea billets for career personnel? These numbers represent the present billet structure and continuation behavior for the nonstudent male component of the Navy minus approximately 10 ratings that have an unusually large shore billet to sea billet ratio. Currently there exist T_2 = 35,550 first-term shore billets and S_2 = 51,158 career shore billets.

This problem illustrates many of the characteristics of the code when it is used to solve for feasible billet structures, continuation rates and sea/shore rotation policies.

First input card format is (5F10.0, 2F10.5).

ALPHA is set equal to 2.0. This option allows all printed output to be presented under two different groupings. T1= 144,835, T2 = 35,550, S1 = 74,612, S2 = 51,158, C = 0.86, and R = 0.09345.

If the three remaining input cards are left blank, default values will be provided by the program. The default values will be shown here as inputs.

Second input card format is (4F10.0). T1T2 = 180,385 total first-term billets, T1S1 = 219,447 total sea billets, T2S2 = 86,708 shore billets, and S1S2 = 125,770 career billets.

Third input card format is (2F9.3, F6.0, F8.5, 2F6.0). A = 3.0 years minimum sea tour, B = 2.0 years minimum shore tour, PERIOD = 4 rotation intervals in one year (four quarters), EPS = .0001 and is the absolute error value for calculating a career continuation rate for the balanced systems I and J. A value of

less than .0001 was not found to significantly increase the accuracy of the solution. SEATIM = 9 sea duty periods to be calculated for each shore duty period, SHOTIM = 5 shore duty periods to be calculated for each sea duty period.

The final input card format is (F7.3, 8F8.0). For the initial run there was no desire to limit the printed output and all nine of these parameters, PERCEN, T1MIN, T1MAX, T2MIN, T2MAX, S1MIN, S1MAX, S2MIN, S2MAX, were equal to zero.

If the user desires to examine only balanced systems whose billet structures are within 30 percent (or any user determined percentage) of the present structure for sea/shore rotation patterns with maximum sea tours no greater than 4 years (in this example all feasible combinations from 12/8 to 16/12 quarters), the four input cards, in the proper format, would be

(1.0, 144,835, 35,550, 74,612, 51,158, 0.86, 0.09345)

(blank card)

(3.0, 2.0, 0.0, 0.0, 5.0, 5.0)

(0.30, blank).

If any balanced system with a career shore component of less than 70,000 and a first-term shore component of less than 50,000 is to be printed, the fourth input card would be

(-1.0, 0., 0., 0., 50000., 0., 0., 0., 70000.).

Part or all of the computer output from these three sets of input parameters is in appendix C.

The shore billet requirements for T_1 = 144,835 and S_1 = 74,612 are presented in table 4 for various rotation policies. If a 12/12 rotation policy was followed, 85,801 additional shore billets would have to be provided for a balanced system. If a 16/8 rotation policy was followed, 293 additional shore billets would have to be followed, 15,388 shore billets would be available for substitution of women or civilians.

TABLE 4
SHORE BILLET REQUIREMENTS WHEN r=0.0935, c=0.8600,
T_1 = 144,835, and S_1 = 74,612

Rotation (a:b)	Career shore billets (S_2)	First-term shore billets (T_2)
12:8	58,662	54,827
12:12	82,288	90,221
13:8	55,387	49,920
14:9	58,169	54,088
16:8	48,059	38,942
16:12	67,414	67,939
17:9	51,107	43,508
20:8	41,782	29,538
20:12	58,610	54,748

2. What sea/shore rotation pattern is best suited to the present billet structure given the continuation characteristics of the personnel inventory?

In order to determine what rotation pattern provides billet structures and continuation rates resembling the Navy's present structure and continuation rates, MOSES was rerun with PERCEN = 0.05. This output is in table 5 which shows that today's billet structure and continuation rates most closely resemble the balanced systems provided by a rotation policy of 17/9 or perhaps 20/10.

Table 6 shows 10 balanced billet structures and continuation rates for a 3/3 rotation pattern. Any attempt to rotate the group of ratings in this sample on a 3/3 pattern would require drastic changes in the Navy's desired billet structure and the continuation behavior of the enlisted personnel.

3. How sensitive is a balanced rotation system to fluctuations in the continuation rates?

The sensitivity of the billet structure to fluctuations in the rates c and r is illustrated in tables 7, 8 and 9.

Even slight alterations in c and r cause sizable changes in shore billet requirements. This type of analysis should be quite helpful when evaluating proposals for sea pay or reenlistment bonuses.

TABLE 5

BALANCED BILLET STRUCTURES WITHIN FIVE PERCENT OF THE PRESENT STRUCTURE

Rotation (a:b)	First-term sea billets (T_1)	First-term shore billets (T_2)	Career sea billets (S_1)	Career shore billets (S_2)	Career continuation rate (c)	First-term retention rate (r)
14:8	148,438	35,550	71,009	51,803	.8600	.0935
14:8	144,835	35,550	74,612	53,469	.8683	.0935
15:8	144,835	35,550	71,375	49,032	.8600	.0935
15:8	147,195	35,550	72,252	49,731	.8600	.0935
15:8	146,714	36,888	72,733	49,820	.8600	.0935
15:8	144,835	35,550	74,612	51,256	.8600	.0977
15:8	144,835	35,550	74,612	50,741	.8656	.0935
16:8	144,835	35,550	74,612	48,622	.8600	.0956
17:9	147,763	35,550	71,684	50,678	.8600	.0935
17:9	144,835	35,550	74,612	52,608	.8600	.0987
17:9	144,835	35,550	74,612	51,874	.8668	.0935
18:9	146,788	35,550	72,659	49,051	.8600	.0935
18:9	144,835	35,550	74,612	50,276	.8600	.0969
18:9	144,835	35,550	74,612	49,776	.8644	.0935
19:10	148,373	35,550	71,074	51,695	.8600	.0935
19:10	144,835	35,550	74,612	53,069	.8679	.0935
20:10	144,835	35,550	70,964	49,443	.8600	.0935
20:10	147,512	35,550	71,935	50,259	.8600	.0937
20:10	147,181	36,420	72,266	50,288	.8600	.0935
20:10	144,835	35,550	74,612	51,985	.8600	.0935
20:10	144,835	35,550	74,612	51,220	.8660	.0935

TABLE 6

BALANCED BILLET STRUCTURES FOR A 3/3

(12/12 QUARTERS) ROTATION PATTERN

First-term sea billets (T_1)	First-term shore billets (T_2)	Career sea billets (S_1)	Career shore billets (S_2)	Career continuation rate (c)	First-term retention rate (r)
144,835	90,221	74,612	82,288	.8600	.09345
10,775	177,645	74,612	51,158	.8600	.09345
144,835	35,550	52,523	67,884	.8600	.09345
144,835	-27,931	26,875	51,158	.8600	.09345
162,317	35,550	57,130	74,947	.8600	.09345
173,685	0	45,762	70,173	.8600	.09345
169,024	14,577	50,423	72,131	.8600	.09345
-12,321	192,706	74,612	45,795	.8600	.09345
144,835	35,550	74,612	96,432	.8600	.13280
144,835	35,550	74,612	90,010	.8976	.09345

TABLE 7

CHANGES IN CAREER CONTINUATION

Rotation pattern (quarters)	Shore billets needed for rotation			
	Current c=0.860	Low c=0.824	Medium c=0.857	High c=0.878
12:12	172,509	213,575	176,068	150,592
14:12	151,223	190,489	154,619	130,341
16:12	135,353	173,336	138,631	115,221
12:8	113,489	153,559	116,915	92,574
17:10	106,436	143,885	109,645	86,810
18:10	101,475	138,508	104,645	82,093
16:8	87,001	124,404	90,190	67,566
17:8	82,365	119,327	85,515	63,181
20:18	71,320	107,281	74,378	52,714

TABLE 8

CHANGES IN FIRST-TERM TO CAREER TRANSITION RATE

Rotation pattern (quarters)	Shore billets needed for rotation		
	Current r=0.09345	Decrease r=0.07943	Increase r=0.10747
12:12	172,509	200,059	153,464
14:12	151,223	176,521	133,843
16:12	135,353	159,241	119,214
12:8	113,489	138,793	95,725
17:10	106,436	128,922	90,951
18:10	101,475	123,436	86,378
16:8	87,001	109,502	71,309
17:8	82,365	104,375	67,036
20:8	71,320	92,161	56,855

TABLE 9

CHANGES IN CAREER AND FIRST-TERM CONTINUATION

Rotation pattern (quarters)	Shore billets needed for rotation		
	Current c=0.8600 r=0.09345	Low c=0.8240 r=0.07943	High c=0.8780 r=0.10747
12:12	172,509	248,019	134,289
14:12	151,223	222,271	115,534
16:12	135,353	203,141	101,531
12:8	113,489	185,347	77,325
17:10	106,436	172,330	73,652
18:10	101,475	166,332	69,284
16:8	87,001	152,831	54,164
17:8	82,365	147,169	50,104
20:8	71,320	133,734	40,409

APPENDIX A

COMPUTATION OF CONTINUATION RATES

Continuation rates for enlisted communities are available to Navy planners on a length of service (LOS) basis. One source is the PROPHET model which calls the rates for length of service categories "bag rates".[1] The first-term transition rate and average career continuation rate used in this rotation model are calculated from these bag rates.

Suppose that the first tour is h periods long and that personnel begin that tour at the end of their ith period of service. In a steady state the number of personnel in the jth LOS category is

$$X_j = X_1 \quad \text{for } j=1$$

and

$$X_j = X_1 \prod_{k=1}^{j-1} C_k \qquad \text{for } j \geq 2$$

where C_i is the continuation rate for personnel with LOS greater than i-1 but not greater than i and X_1 is the number of personnel with length of service less than or equal to one period. The product notation means

$$\prod_{k=1}^{j-1} C_k = C_1 \cdot C_2 \cdot C_3 \cdot \cdots \cdot C_{j-1}.$$

Therefore, the number of personnel assigned to their first tour is

$$T = \sum_{j=i+1}^{i+h} X_j = X_1 \sum_{j=i+1}^{i+h} \left(\prod_{k=1}^{j-1} C_k \right).$$

The flow of personnel completing their first tour is

$$f = X_1 \prod_{k=1}^{i+h} C_k.$$

---

[1]Center for Naval Analyses, Memorandum (CNA)77-1310, "Projections of Navy Enlisted Endstrength with the PROPHET Model: FY 1977-83," by Peter B. McWhite, Unclassified, 30 Aug 1977

The transition rate from the first-term to the career category is

$$r = \frac{f}{T} = \frac{\prod_{k=1}^{i+h} C_k}{\sum_{j=i+1}^{i+h} \left(\prod_{k=1}^{j-1} C_k \right)}$$

$$C = \frac{\sum_{j=i+h+2}^{L} \left(\prod_{k=1}^{j-1} C_k \right)}{\sum_{j=i+h+1}^{L} \left(\prod_{k+1}^{j-1} C_k \right)}$$

The following table presents these continuation parameters calculated for several enlisted groups using the above formulas and LOS bag rates for 1977. The first tour is assumed to consist of LOS categories two, three, and four. For this table, i=1, h=3, and L=31.

TABLE A-1

CONTINUATION PARAMETERS FOR SOME ENLISTED GROUPS

Continuation Parameter	AC	AD	AM	BM	BT
c_2	0.9100	0.9017	0.8924	0.7810	0.7818
c_3	0.8304	0.8286	0.8746	0.6849	0.8121
c_4	0.4441	0.3953	0.4526	0.5362	0.3062
c_5	0.8388	0.8388	0.9146	0.8958	0.8911
c_6	0.7226	0.8699	0.8733	0.8960	0.8894
c_7	0.8703	0.8966	0.9285	0.9351	0.9457
c_8	0.8117	0.9023	0.8592	0.8764	0.8547
c_9	0.7323	0.9084	0.8758	0.9197	0.8349
c_{10}	0.8600	0.9250	0.8918	0.9085	0.7925
c_{11}	0.9200	0.9725	0.9640	0.9327	0.9131
c_{12}	0.9546	0.9689	0.9552	0.9576	0.9279
c_{13}	1.0000	0.9620	0.9627	0.9614	0.8977
c_{14}	0.9758	0.9678	0.9768	0.9464	0.9367
c_{15}	0.9889	0.9720	0.9886	0.9623	0.9612
c_{16}	0.9664	0.9753	0.9946	0.9668	0.9501
c_{17}	0.9626	0.9810	0.9885	0.9620	0.9840
c_{18}	0.9525	0.9440	0.9252	0.9471	0.8998
c_{19}	0.6532	0.5470	0.6070	0.6874	0.6262
c_{20}	0.5936	0.5184	0.5723	0.5133	0.4580

TABLE A-1

(continued)

Continuation Parameter	AC	AD	AM	BM	BT
c_{21}	0.6990	0.6444	0.6227	0.4964	0.5940
c_{22}	0.6931	0.6369	0.7129	0.6260	0.7565
c_{23}	0.9231	0.7438	0.7541	0.7038	0.7332
c_{24}	0.8000	0.8747	0.7302	0.8059	0.6303
c_{25}	1.0000	0.7509	0.8859	0.8756	0.4800
c_{26}	0.8333	0.5402	0.5714	0.7934	0.6111
c_{27}	1.0000	0.6685	0.7500	0.6552	1.0000
c_{28}	0.6000	0.6667	1.0000	1.0000	1.0000
c_{29}	0.8000	0.8549	0.5952	0.8194	0.8000
c_{30}	0.0833	0.1042	0.0000	0.2687	0.0000
c_{31}	0.0000	0.0000	0.0000	0.0000	0.0000
r	0.1259	0.1115	0.1322	0.1238	0.0804
c	0.8405	0.8870	0.8923	0.8940	0.8725

APPENDIX B

PROGRAM LISTINGS AND FLOWCHARTS

```
$RESET FREE
FILE  20(KIND=DISK,TITLE="MOSES1",PROTECTION=SAVE,MAXRECSIZE=23)
FILE  10(KIND=DISK,TITLE="RR66",FILETYPE=8)
FILE  20(KIND=PRINTER,MAXRECSIZE=22)
      COMMON SEA,SHORE,T12,T22,S12,S22,PERCEN,IDENT
      COMMON /TAL1/ S1MIN,S1MAX,T1MIN,T1MAX,S2MIN,S2MAX
     *,T2MIN,T2MAX
      COMMON /FCT1/ T1,T2,S1,S2,C,R,C1,C2,KSEATM,KSHOTM,PERIOD,EPS,
     *T1T2,T1S1,T2S2,S1S2
      READ (10,33) ALPHA,T1,T2,S1,S2,C,R
      READ (10,44) T1T2,T1S1,T2S2,S1S2
      READ (10,55) A,B,PERIOD,EPS,SEATIM,SHOTIM
      READ (10,66) PERCEN,T1MIN,T1MAX,T2MIN,T2MAX,S1MIN,S1MAX,
     *S2MIN,S2MAX
 33   FORMAT (5F10.0,2F10.5)
 44   FORMAT (4F10.0)
 55   FORMAT (2F9.3,F6.0,F8.5,2F6.0)
 66   FORMAT (F7.3,8F8.0)
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
CCC
CC
C       THERE ARE THREE METHODS OF GROUPING OUTPUT:
C          1. BY INPUTS OR SOLUTION VARIABLES   (SUBROUTINE BALANZ)
C          2. BY ROTATION PATTERNS              (SUBROUTINE ROTATE)
C          3. BY BOTH
CCC
C       BY INTER-CHANGING THE INPUT AND OUTPUT VARIABLES THE PROGRAM
C       PRESENTLY SOLVES FOR 10 BALANCED BILLET STRUCTURES FOR EACH OF
C       THE DESIRED QUARTERLY ROTATION PATTERNS.  IF THE USER ALLOWS THE
C       DEFAULT ROTATION PATTERNS TO BE EMPLOYED THERE ARE 45 DIFFERENT
C       ROTATION PATTERNS RANGING BETWEEN 2 TO 5 YEARS AT SEA AND 2 TO 3
C       YEARS ASHORE.  THIS PROVIDES 450 BALANCED SYSTEMS WHICH MAY BE
C       GROUPED IN ANY ONE OF THREE STYLES:
C          1. FOR EACH OF THE 10 INPUT/OUTPUT STRUCTURES DISPLAY ALL
C             SELECTED ROTATION PATTERNS. THIS OPTION IS         ALPHA=0.0
C          2. FOR EACH ROTATION PATTERN DISPLAY ALL 10 BALANCED
C             STRUCTURES.  THIS OPTION IS SELECTED BY SETTING    ALPHA=1.0
C          3. ALL OUTPUT WILL BE SHOWN TWICE GROUPED AS IN #1 AND #2
C                                        THIS OPTION IS          ALPHA=2.0
CCC
CCC
C     SOME OR ALL OF THE FOLLOWING ELEVEN INPUTS ARE MANDATORY INPUTS
C     DEPENDING UPON WHICH OF THE BALANCED BILLET STRUCTURES THE USER
C     DESIRES.   IF THE FIRST SEVEN VARIABLES ARE PROVIDED THEN ALL TEN
C     BALANCED SYSTEMS WILL BE COMPUTED FOR EACH OF THE ROTATION PATTERNS
CC
C         ALPHA-EXPLAINED ABOVE
C         T1----FIRST-TERM SEA BILLETS
C         T2----FIRST-TERM SHORE BILLETS
C         S1----CAREER SEA BILLETS
C         S2----CAREER SHORE BILLETS
C         C ----ANNUAL CAREER CONTINUATION RATE
C         R ----ANNUAL FIRST-TERM RETENTION RATE
CC
C   IF THE FOLLOWING FOUR VARIABLES ARE LEFT EQUAL TO ZERO DEFAULT
C   VALUES WILL BE COMPUTED BY THE PROGRAM
CC
CC
C         T1T2---TOTAL FIRST-TERM BILLETS  (T1+T2)
C         T1S1---TOTAL SEA DUTY BILLETS    (T1+S1)
C         T2S2---TOTAL SHORE DUTY BILLETS  (T2+S2)
```

```
C       S1S2---TOTAL CAREER BILLETS       (S1+S2)
CCCCCCCCC
CC
C   THE FOLLOWING 6 VARIABLES ARE OPTIONAL INPUTS; IF LEFT EQUAL TO
C   ZERO, DEFAULT VALUES WILL BE USED BY THE PROGRAM
CC
CC
C         A------MINIMUM SEA DUTY TOUR IN YEARS   (DEFAULT IS 3)
C         B------MINIMUM SHORE DUTY TOUR IN YEARS (DEFAULT IS 2)
C         PERIOD-NUMBER OF STANDARD ROTATION INTERVALS IN ONE YEAR;
C                IF STANDARD ROTATION INTERVAL IS 3 MONTHS, PERIOD=4;
C                IF STANDARD ROTATION INTERVAL IS 1 MONTH, PERIOD=12;
C                                            (DEFAULT IS 4)
C         EPS----ABSOLUTE ERROR VALUE USED TO CALCULATE A CORRECT
C                CAREER CONTINUATION RATE         (DEFAULT IS .0001)
C         SEATIM-NUMBER OF SEA DUTY PERIODS TO BE PRINTED OUT
C                (A*PERIOD)+SEATIM-1=MAX SEA DUTY TIME
C                                 (DEFAULT IS 2.*PERIOD +1.)
C         SHOTIM-NUMBER OF SHORE DUTY PERIODS TO BE PRINTED OUT
C                (B*PERIOD)+SHOTIM-1=MAX SHORE DUTY TIME
C                                      (DEFAULT IS 1.*PERIOD +1.)
CC
CCCCCCCC
CC
C    THE FOLLOWING 9 VARIABLES ARE ALSO OPTIONAL INPUTS USED TO LIMIT
C    THE PRINTED OUTPUT OF THE PROGRAM TO ONLY THOSE BILLET STRUCTURES
C    WHICH ARE WITHIN THE FEASIBLE BOUNDS DETERMINED BY THE USER:
CC
C         PERCEN---THE MAXIMUM ABSOLUTE % DIFFERENCE BETWEEN THE PRESENT
C                  BILLET STRUCTURE SPECIFIED BY THE USER (T1,T2,S1,S2)
C                  AND THE COMPUTED BILLET STRUCTURES.
C              IF PERCEN=0.0   THIS OPTION WILL BE IGNORED AND ALL BILLET
C                              STRUCTURES COMPUTED WILL BE PRINTED
C              IF PERCEN>0.0   ALL BILLET STRUCTURES WITHIN A PLUS OR
C                              MINUS PERCEN OF THE PRESENT STRUCTURE WILL
C                              BE PRINTED
C              IF PERCEN=-1.0  THE FOLLOWING 8 VARIABLES SUPPLIED BY THE
C                              USER WILL BE UTILIZED
C         T1MIN----MINIMUM NUMBER OF FIRST-TERM SEA BILLETS
C         T1MAX----MAXIMUM NUMBER OF FIRST-TERM SEA BILLETS
C         T2MIN----MINIMUM NUMBER OF FIRST-TERM SHORE BILLETS
C         T2MAX----MAXIMUM NUMBER OF FIRST-TERM SHORE BILLETS
C         S1MIN----MINIMUM NUMBER OF CAREER SEA BILLETS
C         S1MAX----MAXIMUM NUMBER OF CAREER SEA BILLETS
C         S2MIN----MINIMUM NUMBER OF CAREER SHORE BILLETS
C         S2MAX----MAXIMUM NUMBER OF CAREER SHORE BILLETS
CC
CCC
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
CCC
CCCC
C    DETERMINE WHICH DEFAULT VALUES ARE TO BE USED
CCC
CC
      IF (T1T2 .EQ. 0.0) T1T2=T1+T2
      IF (T1S1 .EQ. 0.0) T1S1=T1+S1
      IF (T2S2 .EQ. 0.0) T2S2=T2+S2
      IF (S1S2 .EQ. 0.0) S1S2=S1+S2
      IF (A .EQ. 0.0) A=3.
      IF (B .EQ. 0.0) B=2.
      IF (PERIOD .EQ. 0.0) PERIOD=4.
      IF (EPS .EQ. 0.0) EPS=0.0001
      IF (SEATIM.EQ.0.0) SEATIM=PERIOD*2.+1.
      IF (SHOTIM.EQ.0.0) SHOTIM=PERIOD*1.+1.
```

```
      IF (PERCEN) 70,80,90
   90 S1MIN=S1*(1.-PERCEN)
      S1MAX=S1*(1.+PERCEN)
      T1MIN=T1*(1.-PERCEN)
      T1MAX=T1*(1.+PERCEN)
      T2MIN=T2*(1.-PERCEN)
      T2MAX=T2*(1.+PERCEN)
      S2MIN=S2*(1.-PERCEN)
      S2MAX=S2*(1.+PERCEN)
      GO TO 80
   70   CONTINUE
      IF(T1MAX.EQ.0.) T1MAX=99999999.
      IF(T2MAX.EQ.0.) T2MAX=99999999.
      IF(S1MAX.EQ.0.) S1MAX=99999999.
      IF(S2MAX.EQ.0.) S2MAX=99999999.
   80   CONTINUE
CCC
CCC
C   DEFAULT VALUES ARE SET; NOW DETERMINE VALUES TO BE USED
C   IN DO LOOPS AND OTHER COMPUTATIONS
CCC
CCC
        C2=1.-(1.-C)/PERIOD
          C1=R/PERIOD
          SEA=A*PERIOD
          SHORE=B*PERIOD
        KSEATM=SEATIM
        KSHOTM=SHOTIM
        WRITE (2C,77)  T1,T2,S1,S2,C,R,T1T2,T1S1,T2S2,S1S2,A,B,
     *PERIOD,EPS,SEATIM,SHOTIM,PERCEN,T1MIN,T1MAX,T2MIN,T2MAX,S1MIN,
     *S1MAX,S2MIN,S2MAX,ALPHA
   77  FORMAT (2X,'PROGRAM PARAMETERS&&   T1=',F9.0,';;   T2=',F9.0,
     *';;   S1=',F9.0,';;   S2=',F9.0,';;   C=',F9.5,';;   R=',F9.5
     */7X,'T1T2=',F9.0,';;   T1S1=',F9.0,';;   T2S2=',F9.0,';;'
     *   S1S2=',F9.0,';;   A=',F9.3,';;   B=',F9.3/7X,'PERIOD=',
     *F9.0,';;   EPS=',F9.5,';;   SEATIM=',F9.0,';;   SHOTIM=',F9.0,
     *';;   PERCEN=',F9.3,';;   T1MIN=',F9.0/7X,'T1MAX=',F9.0,';;   T'
     *'2MIN=',F9.0,';;   T2MAX=',F9.0,';;   S1MIN=',F9.0,';;   S1M'
     *'AX=',F9.0,';;   S2MIN=',F9.0,/7X,'S2MAX=',F9.0,';;   ALPHA=',
     *F9.0)
        IF (ALPHA .EQ. 0.0)  GO TO 93
          CALL ROTATE (ALPHA)
        IF (ALPHA .EQ. 1.0)  GO TO 95
   93     CALL BALANZ (ALPHA)
   95   CONTINUE
          END
C
C
CC
CCCC
CCCCCCC      END OF MOSES MAIN PROGRAM      CCCCCCCCCCCCCCCCC
CCCC
CC
C
C**********************************************************************
C
CC
        SUBROUTINE BALANZ (ALPHA)
      COMMON SEA,SHORE,T1Z,T2Z,S1Z,S2Z,PERCEN,IDENT
      COMMON /TAL1/ S1MIN,S1MAX,T1MIN,T1MAX,S2MIN,S2MAX
     *,T2MIN,T2MAX
        COMMON /RCT1/ T1,T2,S1,S2,C,R,C1,C2,KSEATM,KSHOTM,PERIOD,EPS,
     *T1T2,T1S1,T2S2,S1S2
C
```

```
      C THIS SUBROUTINE COMPUTES BALANCED SYSTEMS FOR ALL DESIRED ROTATION
      C PATTERNS UNDER EACH OF THE 10 SEPARATE INPUT/OUTPUT GROUPS.
      C     IDENTICAL COMPUTATIONS AS SUBROUTINE ROTATE;
      C     ONLY DIFFERENCE IS DISPLAY OF OUTPUT
      C
                SSH=SHORE
              SSEA=SEA
       77    FORMAT ('1',5X,'SEA',3X,'SHORE',17X,'TOTAL',5X,'TOTAL',19X,
           *'FIRST',5X,'FIRST',35X,  7X,'FIRST'/
           *4X,'DUTY',3X,'DUTY',6X,  2X,'TOTAL',5X,'FIRST',6X,'AT',7X,
           *'TOTAL',9X,'TERM',6X,'TERM',5X,'CAREER',4X,'CAREER',8X,
           *'CAREER',8X,'TERM'/4X,'TOUR',3X,'TOUR',7X,'CAREER',5X,'TERM',7X,
           *'SEA',5X,'ASHORE',9X,'SHORE',6X,'SEA',7X,'SEA',6X,'SHORE',
           *5X,'CONTINUATION',3X,'RETENTION'//)
       88       FORMAT (1X,'USER INPUTS   ',4X,4F10.0,4X,4F10.0,2X,
           *F11.4,F11.4)
              IDENT=1H
              AA=1.-C2
      CCCCCCCCCCCCCCCCCCCCCCCCCC
      CC
      C   COMPUTE BALANCED SYSTEM "A":
      C
      C       GIVEN VARIABLES:::::::FIRST-TERM SEA BILLETS
      C                             CAREER SEA BILLETS
      C                             CAREER CONTINUATION RATE
      C                             FIRST-TERM RETENTION RATE
      C
      C       SOLUTION  VARIABLES:::FIRST-TERM SHORE BILLETS
      C                             CAREER SHORE BILLETS
      CC
      CCCCCCCCCCCCCCCCCCCCCCCCCC
              WRITE (20,77)
              WRITE (20,88)  S1S2,T1T2,T1S1,T2S2,T2,T1,S1,S2,C,R
                CO 101 JJJ=1,NSEATH
               ASEA=C2**SEA
               AB=1.-ASEA
                CC 100 III=1,NSHOTH
                ASHOR=C2**SHORE
                AC=1.-ASHOR
               BX=1.-C2**(SEA+SHORE)
              T2Z=-ASHOR*T1+BX*AA*S1/(C1*AB)
              S2Z=C1*T1*AC/AA+ASEA*S1*AC/AB
              T1Z=T1
              S1Z=S1
              CALL PRINTT (C,R)
                SHORE=SHORE+1.
       100      CONTINUE
              SEA=SEA+1.
              SHORE=SSH
       101    CONTINUE
              SEA=SSEA
              WRITE (20,133)
             WRITE (20,144)
              WRITE (20,155)
       133   FORMAT (//2X,'GIVEN: FIRST-TERM SEA BILLETS, CAREER SEA BILLETS,'
           *' CAREER CONTINUATION RATE, AND FIRST-TERM RETENTION RATE')
       144   FORMAT(//3(X,'.........THEN FOR THE VARIOUS ROTATION PATTERNS '
           *'ABOVE.........AND A BALANCED SYSTEM'//)
       155    FORMAT (2X,'SOLVE FOR: FIRST-TERM SHORE BILLETS AND CAREER'
           *' SHORE BILLETS')
      CCCCCCCCCCCCCCCCCCCCCCCCCC
      CC
      C   COMPUTE BALANCED SYSTEM "B":
      C
```

```
C       GIVEN VARIABLES:::::::CAREER SHORE BILLETS
C                             CAREER SEA BILLETS
C                             CAREER CONTINUATION RATE
C                             FIRST-TERM RETENTION RATE
C
C       SOLUTION  VARIABLES:::FIRST-TERM SHORE BILLETS
C                             FIRST-TERM SEA BILLETS
CC
CCCCCCCCCCCCCCCCCCCCCCCCCC
        WRITE (20,77)
        WRITE (20,88)  S1S2,T1T2,T1S1,T2S2,T2,T1,S1,S2,C,R
          DO 202 JJJ=1,KSEATM
         ASEA=C2**SEA
         AB=1.-ASEA
          DO 200 III=1,KSHORTM
        AC=1.-C2**SHORE
        T1Z=(S2-ASEA*AC/AB*S1)/C1*AA/AC
        T2Z=S1S2*AA/C1-T1Z
        S2Z=S2
        S1Z=S1
        CALL PRINTT (C,R)
          SHORE=SHORE+1.
 200      CONTINUE
          SEA=SEA+1.
          SHORE=SSH
 202    CONTINUE
        SEA=SSEA
        WRITE (20,233)
       WRITE (20,144)
       WRITE (20,255)
 233    FORMAT (//2X,'GIVEN: CAREER SEA BILLETS, CAREER SHORE BILLETS,'
     *' CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE')
 255    FORMAT (2X,'SOLVE FOR: FIRST-TERM SHORE BILLETS AND '
     *'FIRST-TERM SEA BILLETS')
CCCCCCCCCCCCCCCCCCCCCCCCCC
CC
C   COMPUTE BALANCED SYSTEM "C":
C
C       GIVEN VARIABLES:::::::FIRST-TERM SEA BILLETS
C                             FIRST-TERM SHORE BILLETS
C                             CAREER CONTINUATION RATE
C                             FIRST-TERM RETENTION RATE
C
C       SOLUTION  VARIABLES:::CAREER SEA BILLETS
C                             CAREER SHORE BILLETS
CC
CCCCCCCCCCCCCCCCCCCCCCCCCC
        WRITE (20,77)
        WRITE (20,88)  S1S2,T1T2,T1S1,T2S2,T2,T1,S1,S2,C,R
          DO 303 JJJ=1,KSEATM
        AB=1.-C2**SEA
          DO 300 III=1,KSHORTM
          ASHOR=C2**SHORE
         BX=1.-C2**(SEA+SHORE)
        S1Z=C1*AB*(T2+ASHOR*T1)/(BX*AA)
        S2Z=T1T2*C1/AA-S1Z
        T2Z=T2
        T1Z=T1
        CALL PRINTT (C,R)
          SHORE=SHORE+1.
 300      CONTINUE
          SEA=SEA+1.
          SHORE=SSH
 303    CONTINUE
```

```
3220            SEA=SSEA
3230           WRITE (20,333)
3240             WRITE (20,144)
3250             WRITE (20,355)
3260      333     FORMAT (///2X,'GIVEN: FIRST-TERM SHORE BILLETS, FIRST-'
3270          *'TERM SEA BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM'
3280          *' RETENTION RATE')
3290      355     FORMAT (2X,'SOLVE FOR: CAREER SEA BILLETS AND CAREER SHORE'
3300          *' BILLETS')
3310     CCCCCCCCCCCCCCCCCCCCCCCCCC
3320     CC
3330     C   COMPUTE BALANCED SYSTEM "D":
3340     C
3350     C       GIVEN VARIABLES:::::::FIRST-TERM SHORE BILLETS
3360     C                             TOTAL SEA BILLETS
3370     C                             CAREER CONTINUATION RATE
3380     C                             FIRST-TERM RETENTION RATE
3390     C
3400     C       SOLUTION  VARIABLES:::CAREER SEA BILLETS
3410     C                             CAREER SHORE BILLETS
3420     C                             FIRST-TERM SEA BILLETS
3430     CC
3440     CCCCCCCCCCCCCCCCCCCCCCCCCC
3450             WRITE (20,77)
3460             WRITE (20,88)  S1S2,T1T2,T1S1,T2S2,T2,T1,S1,S2,C,R
3470               DO 505 JJJ=1,KSEATM
3480             AB=1.-C2**SEA
3490                DO 500 III=1,KSHORM
3500                #SHOR=C2**SHORE
3510                BX=1.-C2**(SEA+SHORE)
3520             S1Z=(T1S1*#SHOR+T2)/(ASHOR+(AA+BX)/(C1*AB))
3530             T1Z=T1S1-S1Z
3540             S2Z= (T2+T1Z)*C1/AA-S1Z
3550             T2Z=T2
3560             CALL PRINTT (C,R)
3570               SHORE=SHORE+1.
3580      500      CONTINUE
3590               SEA=SEA+1.
3600               SHORE=SSH
3610      505    CONTINUE
3620             SEA=SSEA
3630             WRITE (20,533)
3640             WRITE (20,144)
3650             WRITE (20,555)
3660      533  FORMAT(///2X,'GIVEN: FIRST-TERM SHORE BILLETS, TOTAL SEA BILLETS'
3670          *', CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE')
3680      555    FORMAT (2X,'SOLVE FOR: FIRST-TERM SEA BILLETS, CAREER SEA'
3690          *' BILLETS AND CAREER SHORE BILLETS')
3700     CCCCCCCCCCCCCCCCCCCCCCCCCC
3710     CC
3720     C   COMPUTE BALANCED SYSTEM "E":
3730     C
3740     C       GIVEN VARIABLES:::::::FIRST-TERM SHORE BILLETS EQUAL ZERO
3750     C                             TOTAL SEA BILLETS
3760     C                             CAREER CONTINUATION RATE
3770     C                             FIRST-TERM RETENTION RATE
3780     C
3790     C       SOLUTION  VARIABLES:::CAREER SEA BILLETS
3800     C                             CAREER SHORE BILLETS
3810     C                             FIRST-TERM SEA BILLETS
3820     CC
3830     CCCCCCCCCCCCCCCCCCCCCCCCCC
3840             WRITE (20,77)
3850             WRITE (20,88)  S1S2,T1T2,T1S1,T2S2,T2,T1,S1,S2,C,R
```

```
3860            T2=0.
3870               DO 600 JJJ=1,KSEATM
3880             AB=1.-C2**SEA
3890               DO 600 III=1,KSHOTM
3900               ASHOR=C2**SHORE
3910              BX=1.-C2**(SEA+SHORE)
3920            S12=(T1S1*ASHOR+T22)/(ASHOR+(AA*BX)/(C1*AB))
3930            T12=T1S1-S12
3940            S22= (T22+T12)*C1/AA-S12
3950            CALL PRINTT (C,R)
3960              SHORE=SHORE+1.
3970       600      CONTINUE
3980              SEA=SEA+1.
3990              SHORE=SSH
4000       606    CONTINUE
4010              SEA=SSEA
4020              WRITE (20,633)
4030              WRITE (20,144)
4040              WRITE (20,555)
4050       633   FORMAT (//2X,'GIVEN: FIRST-TERM SHORE BILLETS EQUAL TO ZERO,'
4060           *' TOTAL SEA BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM '
4070           *'RETENTION RATE')
4080      CCCCCCCCCCCCCCCCCCCCCCCCCC
4090      CC
4100      C    COMPUTE BALANCED SYSTEM "F":
4110      C
4120      C       GIVEN VARIABLES:::::::TOTAL SHORE BILLETS
4130      C                              TOTAL SEA BILLETS
4140      C                              CAREER CONTINUATION RATE
4150      C                              FIRST-TERM RETENTION RATE
4160      C
4170      C       SOLUTION  VARIABLES:::CAREER SEA BILLETS
4180      C                              CAREER SHORE BILLETS
4190      C                              FIRST-TERM SEA BILLETS
4200      C                              FIRST-TERM SHORE BILLETS
4210      CC
4220      CCCCCCCCCCCCCCCCCCCCCCCCCC
4230               WRITE (20,77)
4240               WRITE (20,88)  S1S2,T1T2,T1S1,T2S2,T2,T1,S1,S2,C,R
4250                 DO 707 JJJ=1,KSEATM
4260               AB=1.-C2**SEA
4270                  DO 700 III=1,KSHOTM
4280                  ASHOR=C2**SHORE
4290                  AC=1.-ASHOR
4300                BX=1.-C2**(SEA+SHORE)
4310               XXY=BX/C1*AA/AB
4320               YYX=(T1S1+T2S2)*AA/(C1+AA)
4330               T22=(XXY*(T1S1-YYX)-ASHOR*YYX)/(AC-XXY)
4340               S22=T2S2-T22
4350               T12=YYX-T22
4360               S12=T1S1-T12
4370               CALL PRINTT (C,R)
4380                 SHORE=SHORE+1.
4390        700      CONTINUE
4400               SEA=SEA+1.
4410               SHORE=SSH
4420       707    CONTINUE
4430              SEA=SSEA
4440              WRITE (20,733)
4450              WRITE (20,144)
4460              WRITE (20,755)
4470       733    FORMAT (//2X,'GIVEN: TOTAL SEA BILLETS, TOTAL SHORE BILLETS, '
4480           *'CAREER CONTINUATION RATE AND FIRST TERM RETENTION RATE')
4490       755    FORMAT (2X,'SOLVE FOR: FIRST-TERM SHORE BILLETS, FIRST-TERM '
```

```
4500          *'SEA BILLETS, CAREER SHORE BILLETS AND CAREER SEA BILLETS')
4510      CCCCCCCCCCCCCCCCCCCCCCCCCC
4520      CC
4530      C    COMPUTE BALANCED SYSTEM "G":
4540      C
4550      C       GIVEN VARIABLES:::::::CAREER SEA BILLETS
4560      C                             TOTAL FIRST-TERM BILLETS
4570      C                             CAREER CONTINUATION RATE
4580      C                             FIRST-TERM RETENTION RATE
4590      C
4600      C       SOLUTION  VARIABLES:::CAREER SHORE BILLETS
4610      C                             FIRST-TERM SHORE BILLETS
4620      C                             FIRST-TERM SEA BILLETS
4630      CC
4640      CCCCCCCCCCCCCCCCCCCCCCCCCC
4650              WRITE (2C,77)
4660              WRITE (2C,88)  S1S2,T1T2,T1S1,T2S2,T2,T1,S1,S2,C,R
4670                DO 808 JJJ=1,KSEATH
4680              A8=1.-C2**SEA
4690                DO 800 III=1,KSHOTH
4700                ASHOR=C2**SHORE
4710                AC=1.-ASHOR
4720                BX=1.-C2**(SEA+SHORE)
4730              S2Z=T1T2/AA+C1-S1
4740              T2Z=-ASHOR*T1T2/AC+BX/C1*AA/A8*S1/AC
4750              T1Z=T1T2-T2Z
4760              S1Z=S1
4770              CALL PRINTT (C,R)
4780                SHORE=SHORE+1.
4790       800      CONTINUE
4800                SEA=SEA+1.
4810                SHORE=SSH
4820       808    CONTINUE
4830              SEA=SSEA
4840              WRITE (20,833)
4850              WRITE (20,144)
4860              WRITE (2C,855)
4870       833    FORMAT (//2X,'GIVEN: CAREER SEA BILLETS, TOTAL FIRST-TERM '
4880             *'BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM'
4890             *' RETENTION RATE')
4900       855    FORMAT (2X,'SOLVE FOR: FIRST-TERM SHORE BILLETS, FIRST-'
4910             *'TERM SEA BILLETS AND CAREER SHORE BILLETS')
4920      CCCCCCCCCCCCCCCCCCCCCCCCCC
4930      CC
4940      C    COMPUTE BALANCED SYSTEM "H":
4950      C
4960      C       GIVEN VARIABLES:::::::FIRST-TERM SEA BILLETS
4970      C                             FIRST-TERM SHORE BILLETS
4980      C                             CAREER SEA BILLETS
4990      C                             CAREER CONTINUATION RATE
5000      C
5010      C       SOLUTION  VARIABLES:::FIRST-TERM RETENTION RATE
5020      C                             CAREER SHORE BILLETS
5030      CC
5040      CCCCCCCCCCCCCCCCCCCCCCCCCC
5050                TTT=T1+T2
5060                IF (TTT .LT. 1.0)  GO TO 1025
5070               WRITE (20,77)
5080               WRITE (2C,88)  S1S2,T1T2,T1S1,T2S2,T2,T1,S1,S2,C,R
5090                 DO 909 JJJ=1,KSEATH
5100               A8=1.-C2**SEA
5110                 DO 9CC III=1,KSHOTH
5120                 ASHOR=C2**SHORE
5130               BX=1.-C2**(SEA+SHORE)
```

```
5140            C11=C1
5150           C1=EX*AA/AB*S1/(T2*ASHOR*T1)
5160             S2Z=T1T2*C1/AA-S1
5170           T1Z=T1
5180           T2Z=T2
5190           S1Z=S1
5200           RRR=R
5210           R=C1*PEFICC
5220           CALL PRINTT (C,R)
5230     C     CALL CHECK
5240           R=RRR
5250           C1=C11
5260             SHORE=SHORE+1.
5270      900      CONTINUE
5280             SEA=SEA+1.
5290             SHORE=SSH
5300      909    CONTINUE
5310           SEA=SSEA
5320           WRITE (20,933)
5330           WRITE (20,144)
5340           WRITE (20,955)
5350      933    FORMAT (///2X,'GIVEN: FIRST-TERM SHORE BILLETS, FIRST-TERM'
5360          *' SEA BILLETS, CAREER SEA BILLETS AND CAREER CONTINUATION'
5370          *' RATE')
5380      955    FORMAT (2X,'SOLVE FOR: CAREER SHORE BILLETS AND FIRST-'
5390          *'TERM RETENTION RATE')
5400     CCCCCCCCCCCCCCCCCCCCCCCCCC
5410     CC
5420     C    COMPUTE BALANCED SYSTEM "I":
5430     C
5440     C       GIVEN VARIABLES:::::::FIRST-TERM SEA BILLETS
5450     C                             FIRST-TERM SHORE BILLETS
5460     C                             CAREER SEA BILLETS
5470     C                             FIRST-TERM RETENTION RATE
5480     C
5490     C       SOLUTION  VARIABLES:::CAREER CONTINUATION RATE
5500     C                             CAREER SHORE BILLETS
5510     CC
5520     CCCCCCCCCCCCCCCCCCCCCCCCCC
5530              IF (S1 .LT. 1.0)  GO TO 1025
5540             WRITE (20,77)
5550             WRITE (20,88)  S1S2,T1T2,T1S1,T2S2,T2,T1,S1,S2,C,R
5560                GOAL=C1/S1
5570             DIF=GOAL*EPS
5580               AAA=.2
5590             Z=C.99999
5600               DO 1020  JJJ=1,KSEATN
5610               DO 1010  III=1,KSHOTN
5620                ICOUNT=0
5630             C2Z=AAA
5640              B=(1.-C2Z**(SEA+SHORE))*(1.-C2Z)
5650               E=B/((T2+T1*C2Z**SHORE)*(1.-C2Z**SEA))
5660             IF (B .GT. GOAL)  GO TO 1000
5670               XMIN=AAA
5680               XMAX=Z
5690             GO TO 1002
5700      1000     XMIN=Z
5710               XMAX=AAA
5720      1002      CONTINUE
5730               C2Z=(XMAX+XMIN)/2.
5740              C2Z=AES(C2Z)
5750              B=(1.-C2Z**(SEA+SHORE))*(1.-C2Z)
5760               E=B/((T2+T1*C2Z**SHORE)*(1.-C2Z**SEA))
5770               G1=AES(GOAL-B)
```

```
5780            IF(G1.LE.DIF)  GO TO 1005
5790              IF  (8.GT. GOAL) XMAX=C22
5800             IF (8 .LT. GOAL)   XMIN=C22
5810            ICOUNT=ICOUNT+1
5820            IF (ICOUNT .GE. 30)  WRITE (20,1022)
5830            IF (ICOUNT .GE. 30)  GO TO 1005
5840               GO TO 1002
5850     1005     CONTINUE
5860           CCC=C
5870             C=1.-((1.-C22)*PERIOD)
5880           S22=(C1*T1)*(1.-C22**SHORE)/(1.-C22)
5890           S22=S22+C22**SEA*S1*(1.-C22**SHORE)/(1.-C22**SEA)
5900           T12=T1
5910           T22=T2
5920           S12=S1
5930           C22=C2
5940           C2=C22
5950           CALL PRINTT (C,R)
5960     C     CALL CHECK
5970           C2=C22
5980           C=CCC
5990             SHORE=SHORE+1.
6000     1010      CONTINUE
6010             SEA=SEA+1.
6020             SHORE=SSH
6030     1020    CONTINUE
6040             SEA=SSEA
6050     1022  FORMAT (//2X,'CONTINUATION EVALUATED MORE THAN 30 TIMES FOR '
6060         +'THE FOLLOWING ROTATION PATTERN WITH NO CONVERGENCE'//)
6070           WRITE (20,1033)
6080           WRITE (20,144)
6090           WRITE (20,1055)
6100             GO TO 1099
6110     1025  WRITE (20,1066)
6120     1033    FORMAT (//2X,'GIVEN: FIRST-TERM SHORE BILLETS, FIRST-TERM'
6130         +' SEA BILLETS, CAREER SEA BILLETS AND FIRST-TERM RETENTION'
6140         +' RATE')
6150     1055    FORMAT (2X,'SOLVE FOR: CAREER SHORE BILLETS AND CAREER '
6160         +'CONTINUATION RATE')
6170     1066  FORMAT ('1',3X,'NO SOLUTIONS FOR THE VARIABLE CONTINUATION '
6180         +'RATES DUE TO LACK OF NON-ZERO INPUTS')
6190     1099    CONTINUE
6200     CC
6210     CCCCCCCCCCCCCCCCCCCCCCCCCC
6220     CC
6230     C   COMPUTE BALANCED SYSTEM "J":
6240     C
6250     C      GIVEN VARIABLES:::::::FIRST-TERM SEA BILLETS
6260     C                            FIRST-TERM SHORE BILLETS
6270     C                            CAREER SEA BILLETS
6280     C                            CAREER SHORE BILLETS
6290     C
6300     C      SOLUTION  VARIABLES:::CAREER CONTINUATION RATE
6310     C                            FIRST-TERM RETENTION RATE
6320     CC
6330     CCCCCCCCCCCCCCCCCCCCCCCCCC
6340              IF ((S1+S2) .LT. 1.0)  GO TO 1125
6350              IF ((T1+T2) .LT. 1.0)  GO TO 1125
6360             WRITE (20,77)
6370             WRITE (20,88)  S1S2,T1T2,T1S1,T2S2,T2,T1,S1,S2,C,R
6375             OEPS=EPS
6377             EPS=EPS*.1
6380               GOAL=(T1/S2)*((S1+S2)/(T1+T2))
6390             DIF=GOAL*EPS
```

```
6400              AAA=.2
6410             Z=C.99999
6420               CO 1120  JJJ=1,KSEATH
6430               DO 1111  III=1,KSHOTP
6440                ICCUNT=0
6450             C22=AAA
6460            B=1/(1.-C22**SHORE)-(S1*C22**SEA)/(S2*(1-C22**SEA))
6470             IF (B .GT. GOAL)  GO TO 1100
6480               XMIN=AAA
6490               XMAX=Z
6500             GO TO 1102
6510     1100      XMIN=Z
6520               XMAX=AAA
6530     1102       CONTINUE
6540               C22=(XMAX+XMIN)/2.
6550            B=1/(1.-C22**SHORE)-(S1*C22**SEA)/(S2*(1-C22**SEA))
6560               G1=ABS(GOAL-B)
6570              IF(G1.LE.DIF)  GO TO 1105
6580                IF  (B.GT. GOAL) XMAX=C22
6590             IF (B .LT. GOAL)   XMIN=C22
6600             ICCUNT=ICCUNT+1
6610             IF (ICOUNT .LT. 30) GO TO 1102
6620             IF (PERCEN .NE. 0.0) GO TO 1110
6640     1105      CONTINUE
6650             CCC=C
6660              C=1.-((1.-C22)*PERIOD)
6670             RZ=C1
6680            C1=(1.-C22)*(S1+S2)/(T1+T2)
6690            T1Z=T1
6700            T2Z=T2
6710            S1Z=S1
6720             S2Z=S2
6730             C2Z=C2
6740              C2=C22
6750              RR=R
6760                F=C1*PERIOD
6762              IF (ICOUNT .LT. 30) GO TO 1108
6764            WRITE (20,1144) IDENT,SEA,SHORE,T2Z,T1Z,S1Z,S2Z,C,R
6768            GO TO 1109
6770     1108       CALL PRINTT (C,R)
6775     1109       CONTINUE
6780     C       CALL CHECK
6790                C1=RZ
6800                 C=CCC
6810                 C2=C22
6820                 R=RR
6825     1110       CONTINUE
6830               SHORE=SHORE+1.
6840     1111        CONTINUE
6850               SEA=SEA+1.
6860               SHORE=SSH
6870     1120    CONTINUE
6880             SEA=SSEA
6910            WRITE (20,1133)
6920            WRITE (20,144)
6930            WRITE (20,1155)
6935             EPS=DEPS
6940              RETURN
6950     1125   WRITE (20,1166)
6960     1133    FORMAT (///2X,'GIVEN: FIRST-TERM SHORE BILLETS, FIRST-TERM'
6970         ,' SEA BILLETS, CAREER SEA BILLETS AND CAREER SHORE BILLETS')
6972     1144  FORMAT(1X,A1,F6.0,F7.0,14X,'NO FEASIBLE SOLUTION',14X,4F10.0,2X,
6974         'F11.4,F13.4)
6980     1155    FORMAT (2X,'SOLVE FOR: FIRST-TERM RETENTION RATE AND CAREER '
```

```
6990          **CONTINUATION RATE*)
7000       1166  FORMAT (*1*,3X,*NO SOLUTIONS FOR THE VARIABLE CONTINUATION *
7010          **RATES DUE TO LACK OF NON-ZERO INPUTS*)
7020              RETURN
7030             END
7040      CCCC
7050      CCCCCCC      END OF BALAN2 SUBROUTINE       CCCCCCCCCCCCCCCCC
7060      CCCC
7070      CC
7080      C
7090      C*************************************************************************L
7100      C
7110      C
7120      C
7130             SUBROUTINE PRINT1 (C,R)
7140             COMMON SEA,SHORE,T12,T22,S12,S22,PERCEN,IDENT
7150      CC
7160      CCCCCCCCCCCC
7170      C  THIS SUBROUTINE PROVIDES THE PRINTED OUTPUT FOR THE MODEL AFTER
7180      C  ADDING THE FOUR BASIC BILLET GROUPS T1,T2,S1,S2 TO FORM THE TOTAL
7190      C  CAREER, TOTAL FIRST-TERM, TOTAL SEA AND TOTAL SHORE BILLET GROUPINGS
7200      CCCCCCCCCCC
7210      CC
7220      C         CALL CHECK
7230             KT1=T12+0.5
7240             KT2=T22+0.5
7250             KS1=S12+0.5
7260             KS2=S22+0.5
7270              S1S2Z=FLOAT (KS1+KS2)
7280             T1T2Z= FLOAT (KT1+KT2)
7290             T1S1Z= FLOAT (KT1+KS1)
7300             T2S2Z= FLOAT (KT2+KS2)
7310              TEST=0.0
7320      CCCC
7330      CC
7340      C  DETERMINE IF ALL BILLET STRUCTURES ARE TO BE PRINTED OR ONLY THOSE
7350      C  WITHIN FEASIBLE BOUNDS
7360      CC
7370      CCCC
7380              IF (PERCEN .EQ. 0.0) GO TO 2000
7390               CALL FEASBL (TEST)
7400               IF (TEST .EQ. 0.0) RETURN
7410       2000    WRITE (20,2020) IDENT,SEA,SHORE,S1S2Z,T1T2Z,T1S1Z,T2S2Z,
7420          *T2Z,T12,S12,S22,C,R
7430       2020  FORMAT(1X,A1,F6.0,F7.0,4X,4F10.0,4X,4F10.0,2X,F11.4,F13.4)
7440              RETURN
7450               END
7460      CCC
7470      CCC
7480      CCC
7490      C
7500      C
7510      C*************************************************************************
7520      C
7530      C
7540      C
7550                SUBROUTINE FEASBL (TEST)
7560             COMMON SEA,SHORE,T12,T22,S12,S22,PERCEN,IDENT
7570             COMMON /TAL1/ S1MIN,S1MAX,T1MIN,T1MAX,S2MIN,S2MAX
7580          *,T2MIN,T2MAX
7590      CCC
7600      CCCCCCCCCCCCCCC
7610      C  AN OPTIONAL SUBROUTINE THAT DETERMINES WHICH BILLET STRUCTURES
7620      C  ARE WITHIN THE FEASIBLE LIMITS SET BY THE USER
```

```
7630     CCCCCCCCCCCCCCC
7640     CCC
7650             IF (S12 .LT. S1MIN)  RETURN
7660             IF (S12 .GT. S1MAX)  RETURN
7670              IF (T12 .LT.T1MIN) RETURN
7680              IF (T12 .GT. T1MAX) RETURN
7690              IF (T22 .LT.T2MIN) RETURN
7700              IF (T22 .GT. T2MAX)) RETURN
7710             IF (S22 .LT. S2MIN)  RETURN
7720             IF (S22 .GT. S2MAX)  RETURN
7730              TEST =1.0
7740             RETURN
7750             END
7760     CCC
7770     CCC
7780     CCC
7790     C*****************************************************************************
7800     C
7810     C
7820     C
7830              SUBROUTINE CHECK
7840            COMMON SEA,SHORE,T12,T22,S12,S22,PERCEN,IDENT
7850             COMMON /ROT1/ T1,T2,S1,S2,C,R,C1,C2,KSEATM,KSHOTM,PERIOD,EPS,
7860          *T1T2,T1S1,T2S2,S1S2
7870     CCC
7880     CCC
7890     CCCCCCCCCCCCCCC
7900     C  THIS SUBROUTINE, IF CALLED, WILL CHECK A BILLET STRUCTURE FOR
7910     C  BALANCE.  IT WILL DETERMINE AND PRINT THE NUMBER OF GAINS FROM
7920     C  THE FIRST-TERMERS TO THE CAREER FORCE AND THE NUMBER OF LOSSES
7930     C  FROM THE CAREER FORCE FOR EACH PERIOD.  IT WILL ALSO DETERMINE
7940     C  THE GAINS TO AND LOSSES FROM THE CAREER SEA FORCE FOR EACH
7950     C  PERIOD.
7960     CC
7970     C  ANYTIME THE USER ADDS A NEW BILLET STRUCTURE COMPUTATION THIS
7980     C  SUBROUTINE CAN BE UTILIZED TO CHECK FOR A BALANCED SYSTEM
7990     C  AND CORRECT COMPUTER PROGRAMING.
8000     CC
8010     CCC
8020     CCCCCCCCCCCCCCCCCCCC
8030     CC
8040               WRITE (2C,4044)
8050               WRITE (20,4055) T12,T22,S12,S22,C,R,SEA,SHORE
8060      4044     FORMAT (//10X,'SUBROUTINE CHECK'/)
8070      4C55     FORMAT (1CX,'T1 IS ',F8.C,5X,'T2 IS ',F8.0,5X,
8080          *'S1 IS ',F8.0,5X,'S2 IS ',F8.0/10X,'C IS ',F10.6,5X,
8090          *'R IS ',F1C.6,5X,'A IS ',F4.0,5X,'B IS ',F4.0)
8100               X=(1.-C2)*(S12+S22)
8110               Y=(T12+T22)*C1
8120               WRITE (20,4066) X,Y
8130      4066     FCRMAT (/7X,'TOTAL CAREER LOSSES ARE ',F6.0/8X,'TOTAL CAREER'
8140          *' GAINS ARE ',F6.0)
8150               CNN=(S12*(1.-C2))/(1.-C2**SEA)
8160      4077       FORMAT (10X,'CAREER SEA GAINS ARE ',F6.0/9X,
8170          **CAREER SEA LOSSES ARE ',F6.0)
8180               CNN=CNN*C2**SEA
8190               CNN=CNN+S12*(1.-C2)
8200               CNNEW=((S22*(1.-C2))/(1.-C2**SHORE))*C2**SHORE +T22*C1
8210                  WRITE (2C,4077)  CNN,CNNEW.
8220                   RETURN
8230                    END
8240     C
8250     C
8260     C
```

```
8270     C
8280     C*****************************************************************
8290     C
8300     C
8310     C
8320             SUBROUTINE ROTATE (ALPHA)
8330           COMMON SEA,SHORE,T1Z,T2Z,S1Z,S2Z,PERCEN,IDENT
8340           COMMON /TAL1/ S1MIN,S1MAX,T1MIN,T1MAX,S2MIN,S2MAX
8350          *,T2MIN,T2MAX
8360             COMMON /RCT1/ T1,T2,S1,S2,C,R,C1,C2,KSEATM,KSHOTM,PERIOD,EPS,
8370          *T1T2,T1S1,T2S2,S1S2
8380     C
8390     C THIS SUBROUTINE COMPUTES BALANCED SYSTEMS FOR ALL 10 INPUT/OUTPUT
8400     C STRUCTURES FOR EACH OF THE DESIRED ROTATION PATTERNS
8410     C       IDENTICAL COMPUTATIONS AS SUBROUTINE BALANZ
8420     C       ONLY DIFFERENCE IS DISPLAY OF OUTPUT
8430      103    FORMAT ('1',5X,'SEA',3X,'SHORE',17X,'TOTAL',5X,'TOTAL',19X,
8440          *'FIRST',5X,'FIRST',35X, 7X,'FIRST'/
8450          *4X,'DUTY',3X,'DUTY',6X, 2X,'TOTAL',5X,'FIRST',6X,'AT',7X,
8460          *'TOTAL',5X,'TERM',6X,'TERM',5X,'CAREER',4X,'CAREER',8X,
8470          *'CAREER',8X,'TERM'/6X,'TOUR',3X,'TOUR',7X,'CAREER',5X,'TERM',7X,
8480          *'SEA',5X,'ASHORE',9X,'SHORE',6X,'SEA',7X,'SEA',6X,'SHORE',
8490          *5X,'CONTINUATION',3X,'RETENTION'//)
8500      115       FORMAT (1X,'USER INPUTS    ',4X,4F10.0,4X,4F10.0,2X,
8510          *F11.4,F13.4)
8520             WRITE (20,122)
8530             WRITE (20,133)
8540             WRITE (20,155)
8550             WRITE (20,233)
8560            WRITE (20,255)
8570            WRITE (20,333)
8580              WRITE (20,355)
8610             WRITE (20,533)
8620             WRITE (20,555)
8630             WRITE (20,633)
8640             WRITE (20,655)
8650             WRITE (20,733)
8660             WRITE (20,755)
8670             WRITE (20,833)
8680             WRITE (20,855)
8690             WRITE (20,933)
8700             WRITE (20,955)
8710             WRITE (20,1033)
8720             WRITE (20,1055)
8725             WRITE (20,1133)
8727             WRITE (20,1155)
8730      122    FORMAT (//15X,'SUMMARY OF INPUT AND OUTPUT VARIABLES FOR'
8740          *' LINES  A-J  ARE:')
8750      133     FORMAT (//2X,'A   GIVEN: FIRST-TERM SEA BILLETS, CAREER SEA '
8760          *'BILLETS,CAREER CONTINUATION RATE, AND FIRST-TERM RETENTION '
8770          *'RATE')
8780      155     FORMAT (6X,'SOLVE FOR: FIRST-TERM SHORE BILLETS AND CAREER'
8790          *' SHORE BILLETS')
8800      233    FORMAT (//2X,'B   GIVEN: CAREER SEA BILLETS, CAREER SHORE BILL'
8810          *'ETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE')
8820      255     FORMAT (6X,'SOLVE FOR: FIRST-TERM SHORE BILLETS AND '
8830          *'FIRST-TERM SEA BILLETS')
8840      333       FORMAT (//2X,'C   GIVEN: FIRST-TERM SHORE BILLETS, FIRST-'
8850          *'TERM SEA BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM'
8860          *' RETENTION RATE')
8870      355       FORMAT (6X,'SOLVE FOR: CAREER SEA BILLETS AND CAREER SHORE'
8880          *' BILLETS')
8930      533    FORMAT(//2X,'D   GIVEN: FIRST-TERM SHORE BILLETS, TOTAL SEA BILL'
8940          *'ETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE')
```

```
 555    FORMAT (6X,'SOLVE FOR: FIRST-TERM SEA BILLETS, CAREER SEA'
     *' BILLETS AND CAREER SHORE BILLETS')
 633    FORMAT (//2X,'E   GIVEN: FIRST TERM SHORE BILLETS EQUAL TO ZER'
     *'O, TOTAL SEA BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM '
     *'RETENTION RATE')
 733    FORMAT (//2X,'F   GIVEN: TOTAL SEA BILLETS, TOTAL SHORE BILLET'
     *'S, CAREER CONTINUATION RATE AND FIRST TERM RETENTION RATE')
 755    FORMAT (6X,'SOLVE FOR: FIRST-TERM SHORE BILLETS, FIRST-TERM '
     *'SEA BILLETS, CAREER SHORE BILLETS AND CAREER SEA BILLETS')
 833    FORMAT (//2X,'G   GIVEN: CAREER SEA BILLETS, TOTAL FIRST-TERM '
     *'BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM'
     *' RETENTION RATE')
 855    FORMAT (6X,'SOLVE FOR: FIRST-TERM SHORE BILLETS, FIRST-'
     *'TERM SEA BILLETS AND CAREER SHORE BILLETS')
 933    FORMAT (//2X,'H   GIVEN: FIRST-TERM SHORE BILLETS, FIRST-TERM'
     *' SEA BILLETS, CAREER SEA BILLETS AND CAREER CONTINUATION'
     *' RATE')
 955    FORMAT (6X,'SOLVE FOR: CAREER SHORE BILLETS AND FIRST-'
     *'TERM RETENTION RATE')
1033    FORMAT (//2X,'I   GIVEN: FIRST-TERM SHORE BILLETS, FIRST-TERM'
     *' SEA BILLETS, CAREER SEA BILLETS AND FIRST-TERM RETENTION'
     *' RATE')
1055    FORMAT (6X,'SOLVE FOR: CAFEER SHORE BILLETS AND CAREER '
     *'CONTINUATION RATE')
1133    FORMAT (//2X,'J   GIVEN: FIRST-TERM SHORE BILLETS, FIRST-TERM'
     *' SEA BILLETS, CAREER SEA BILLETS AND CAREER SHORE BILLETS')
1155    FORMAT (6X,'SOLVE FOR: FIRST-TERM RETENTION RATE AND CAREER '
     *'CONTINUATION RATE')
CCCCCCCCCCCCCCC
CCCCCCCCCCCCCCC     COMPUTATIONS BEGIN HERE
CCCCCCCCCCCCCCC
          SSEA=SEA
          SSH=SHORE
         AA=1.-C2
        IS=0
          DO 999 JJJ=1,KSEATM
         ASEA=C2**SEA
         AE=1.-ASEA
          DO 998 III=1,KSHOTM
        IS=IS+1
        ID=IS/5
        IF (ID .EQ. 1) IS=1
        IF (IS .EQ. 1) WRITE (2C,1C3)
         WRITE (2C,115)  S1S2,T1T2,T1S1,T2S2,T2,T1,S1,S2,C,R
 193     CONTINUE
          ASHOR=C2**SHORE
          AC=1.-ASHOR
         BX=1.-C2**(SEA+SHORE)
C
C  BALANCED STRUCTURE "A":
C  GIVEN:       T1,S1,C,R
C  SOLVE FOR:   T2,S2
C
       T2Z=-ASHOR*T1+BX*AA*S1/(C1*AB)
       S2Z=C1*T1*AC/AA+ASEA*S1*AC/AB
       T1Z=T1
       S1Z=S1
         ICENT=1HA
       CALL PRINTT (C,R)
C
C  BALANCED STRUCTURE "B":
C  GIVEN:       S1,S2,C,R
C  SOLVE FOR:   T1,T2
C
```

```
9570            T1Z=(S2-ASEA*AC/AB*S1)/C1*AA/AC
9580            T2Z=S1S2*AA/C1-T1Z
9590            S2Z=S2
9600            S1Z=S1
9610              ICENT=1HE
9620            CALL PRINTT (C,R)
9630      C
9640      C  BALANCED STRUCTURE "C":
9650      C  GIVEN:       T1,T2,C,R
9660      C  SOLVE FOR:   S1,S2
9670      C
9680            S1Z=C1*AB*(T2+ASHOR*T1)/(BX*AA)
9690           S2Z=T1T2*C1/AA-S1Z
9700            T2Z=T2
9710            T1Z=T1
9720              ICENT=1HC
9730            CALL PRINTT (C,R)
9740      C
9750      C  BALANCED STRUCTURE "D":
9760      C  GIVEN:       T2,T1S1,C,R
9770      C  SOLVE FOR:   T1,S1,S2
9780      C
9790            S1Z=(T1S1*ASHOR+T2)/(ASHOR*(AA*BX)/(C1*AB))
9800            T1Z=T1S1-S1Z
9810           S2Z=(T2+T1Z)*C1/AA-S1Z
9820            T2Z=T2
9830              IDENT=1HD
9840            CALL PRINTT (C,R)
9850      C
9860      C  BALANCED STRUCTURE "E":
9870      C  GIVEN:       T2=0.,T1S1,C,R
9880      C  SOLVE FOR:   T1,S1,S2
9890      C
9900            T2Z=0.
9910            S1Z=(T1S1*ASHOR+T2Z)/(ASHOR*(AA*BX)/(C1*AB))
9920            T1Z=T1S1-S1Z
9930            S2Z=(T2Z+T1Z)*C1/AA-S1Z
9940              ICENT=1HE
9950            CALL PRINTT (C,R)
9960      C
9970      C  BALANCED STRUCTURE "F":
9980      C  GIVEN:       T1S1,T2S2,C,R
9990      C  SOLVE FOR:   T1,T2,S1,S2
10000     C
10010           XXY=BX/C1*AA/AB
10020           YYX=(T1S1+T2S2)*AA/(C1*AA)
10030           T2Z=(XXY*(T1S1-YYX)-ASHOR*YYX)/(AC-XXY)
10040           S2Z=T2S2-T2Z
10050           T1Z=YYX-T2Z
10060           S1Z=T1S1-T1Z
10070             IDENT=1HF
10080           CALL PRINTT (C,R)
10090     C
10100     C  BALANCED STRUCTURE "G":
10110     C  GIVEN:       S1,T1T2,C,R
10120     C  SOLVE FOR:   T1,T2,S2
10130     C
10140           S2Z=T1T2/AB*C1-S1
10150           T2Z=-ASHOR*T1T2/AC+BX/C1*AA/AB*S1/AC
10160           T1Z=T1T2-T2Z
10170           S1Z=S1
10180             IDENT=1HG
10190           CALL PRINTT (C,R)
10200     C
```

```
10210     C  BALANCED STRUCTURE "H":
10220     C  GIVEN:       T1,T2,S1,C
10230     C  SOLVE FOR:   S2,R
10240     C
10250           TTT=T1+T2
10260           IF (TTT .LT. 1.0)  GO TO 1025
10270          C11=C1
10280           C1=EX*AA/AB*S1/(T2+ASHOR*T1)
10290           S22= TIT2*C1/AA-S1
10300           T12=T1
10310           T22=T2
10320           S12=S1
10330             IDENT=1HH
10340          RRR=R
10350           R=C1*PERIOD
10360           CALL PRINTT (C,R)
10370     C       CALL CHECK
10380           C1=C11
10390          R=RRR
10400     C
10410     C  BALANCED STRUCTURE "I":
10420     C  GIVEN:       T1,T2,S1,R
10430     C  SOLVE FOR:   S2,C
10440     C
10450           IF (S1 .LT. .0)    GO TO 1025
10460           ICOUNT=0
10470               GOAL=C1/S1
10480          DIF=GOAL*EPS
10490             A=.2
10500           Z=(.99999
10510           C22=A
10520            B=(1.-C22**(SEA+SHORE))*(1.-C22)
10530              B=B/((T2+T1*C22**SHORE)*(1.-C22**SEA))
10540           IF (B .GT. GOAL)  GO TO 25
10550             XMIN=A
10560             XMAX=Z
10570           GO TO 26
10580       25    XMIN=Z
10590           XMAX=A
10600       26    CONTINUE
10610             C22=(XMAX+XMIN)/2.
10620           C22=ABS(C22)
10630           B=(1.-C22**(SEA+SHORE))*(1.-C22)
10640             B=B/((T2+T1*C22**SHORE)*(1.-C22**SEA))
10650             G1=ABS(GOAL-B)
10660           IF(G1.LE.DIF)  GO TO 50
10670             IF  (B.GT. GOAL) XMAX=C22
10680           IF (B .LT. GOAL)   XMIN=C22
10690            ICOUNT=ICOUNT+1
10700           IF (ICOUNT .GE. 30)  WRITE (20,1022)
10710           IF (ICOUNT .GE. 30)  GO TO 50
10720      1022  FORMAT (/2X,*CONTINUATION EVALUATED MORE THAN 30 TIMES FOR *
10730          **THE FOLLOWING ROTATION PATTERN WITH NO CONVERGENCE*/)
10740             GO TO 26
10750       50    CONTINUE
10760             CCC=C
10770              C=1.-((1.-C22)*PERIOD)
10780           S22=(C1*T1)*(1.-C22**SHORE)/(1.-C22)
10790           S22=S22+C22**SEA*S1*(1.-C22**SHORE)/(1.-C22**SEA)
10800           T12=T1
10810           T22=T2
10820           S12=S1
10830             IDENT=1HI
10840             C22=C2
```

```
10850            C2=C22
10860           CALL PRINTT (C,R)
10870     C      CALL CHECK
10880            C2=C22
10890            C=CCC
10900              GO TO 1030
10910      1025    WRITE (20,1066)
10920      1030    CONTINUE
10930      1066    FORMAT (/3X,'NO SOLUTIONS FOR VARIABLE CONTINUATION RATES '
10940          ,'DUE TO LACK OF NON-ZERO INPUTS')
11030     C
11040     C  BALANCED STRUCTURE "J":
11050     C  GIVEN:       T1,T2,S1,S2
11060     C  SOLVE FOR:   R,C
11070     C
11080              IF ((S1+S2) .LT. 1.0)  GO TO 1125
11090              IF ((T1+T2) .LT. 1.0)  GO TO 1125
11095             CEPS=EPS
11097             EPS=EPS+.1
11098              GOAL=(T1/S2)+((S1+S2)/(T1+T2))
11130             DIF=GOAL*EPS
11140               AAA=.2
11150             Z=0.99999
11160                ICOUNT=0
11190             C22=AAA
11200            B=1/(1.-C22**SHORE)-(S1*C22**SEA)/(S2*(1-C22**SEA))
11210             IF (B .GT. GOAL)  GO TO 1100
11220               XMIN=AAA
11230               XMAX=Z
11240             GO TO 1102
11250      1100     XMIN=Z
11260               XMAX=AAA
11270      1102      CONTINUE
11280               C22=(XMAX+XMIN)/2.
11290            B=1/(1.-C22**SHORE)-(S1*C22**SEA)/(S2*(1-C22**SEA))
11300             G1=ABS(GOAL-B)
11310              IF(G1.LE.DIF)  GO TO 1105
11320                IF  (B.GT. GOAL) XMAX=C22
11330              IF (B .LT. GOAL)   XMIN=C22
11340             ICOUNT=ICOUNT+1
11350             IF (ICOUNT .LT. 30) GO TO 1102
11360             IF (PERCEN .NE. 0.0) GO TO 1110
11380      1105     CONTINUE
11390             CCC=C
11400              C=1.-((1.-C22)*PERIOD)
11410             R2=C1
11420            C1=(1.-C22)*(S1+S2)/(T1+T2)
11425            ICEAT=1HJ
11430            T12=T1
11440            T22=T2
11450            S12=S1
11460             S22=S2
11470             C22=C2
11480              C2=C22
11490              RR=R
11500                R=C1*PERIOD
11502              IF (ICOUNT .LT. 30) GO TO 1108
11503            WRITE (20,1144) IDENT,SEA,SHORE,T22,T12,S12,S22,C,R
11504            GO TO 1109
11505      1108     CALL PRINTT (C,R)
11506      1109     CONTINUE
11507     C       CALL CHECK
11530               C1=R2
11540                C=CCC
```

```
11550                C2=C22
11560                R=RR
11565      111C     CONTINUE
11675              EPS=DEPS
11680              GO TO 997
11690      1125   WRITE (20,1166)
11693      1144   FORMAT(1X,A1,FE.0,F7.C,14X,'NO FEASIBLE SOLUTION',14X,4F10.0,2X,
11695          'F11.4,F13.4)
11740      1166   FORMAT ('1',3X,'NO SOLUTIONS FOR THE VARIABLE CONTINUATION '
11741          ''RATES DUE TO LACK OF NON-ZERO INPUTS')
11743      997        CONTINUE
11750                 SHORE=SHORE+1
11751              WRITE (20,191)
11752      191         FORMAT (20X,'    ')
11753       998      CONTINUE
11754              SEA=SEA+1.
11755              SHORE=SSH
11756      999    CONTINUE
11757               SEA=SSEA
11760              RETURN
11770            END
11780      C
11790      CC
11800      CCCCCC      END OF SUBROUTINE ROTATE          CCCCCCCC
```

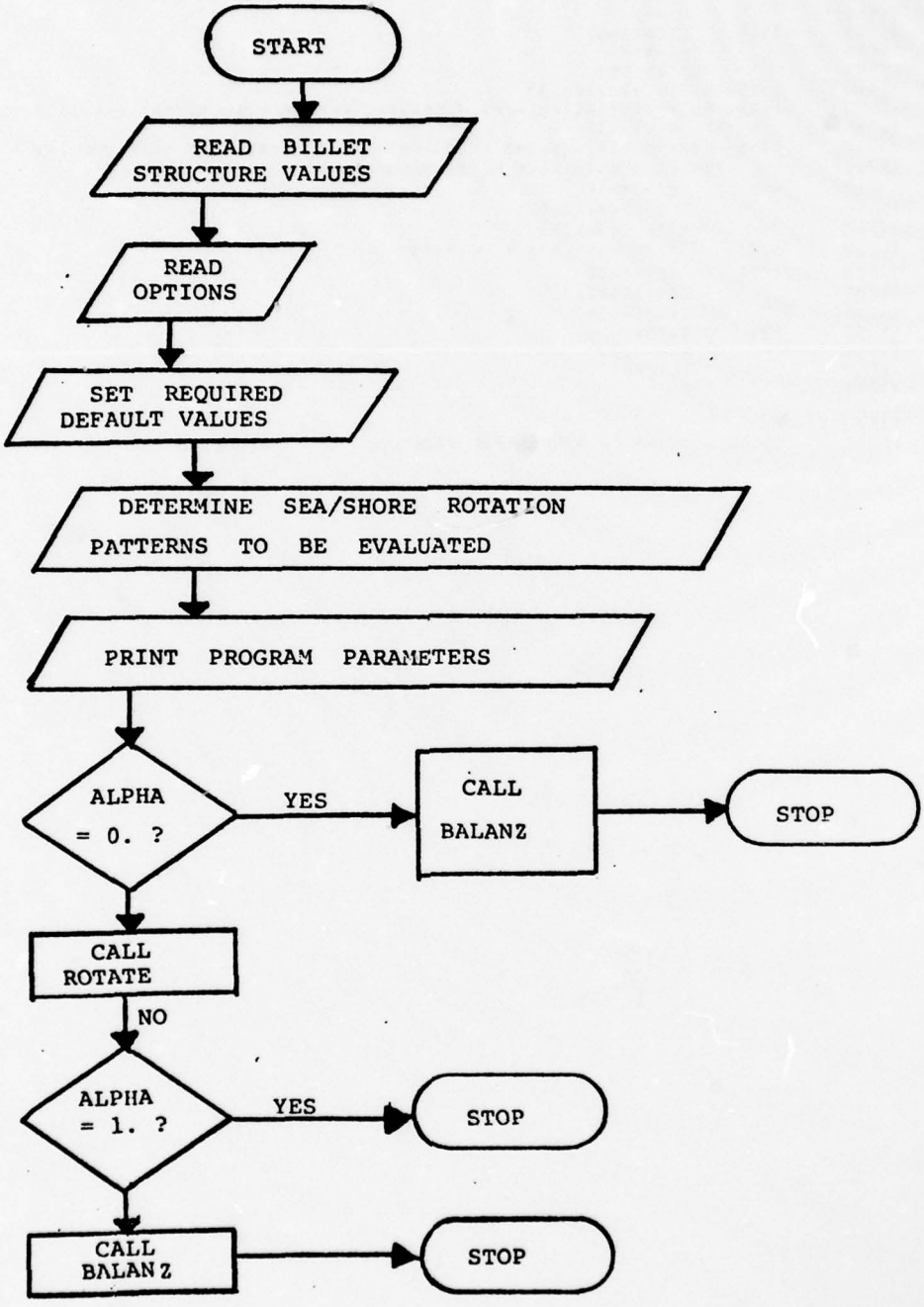

FIG. B-1: Flowchart of MOSES

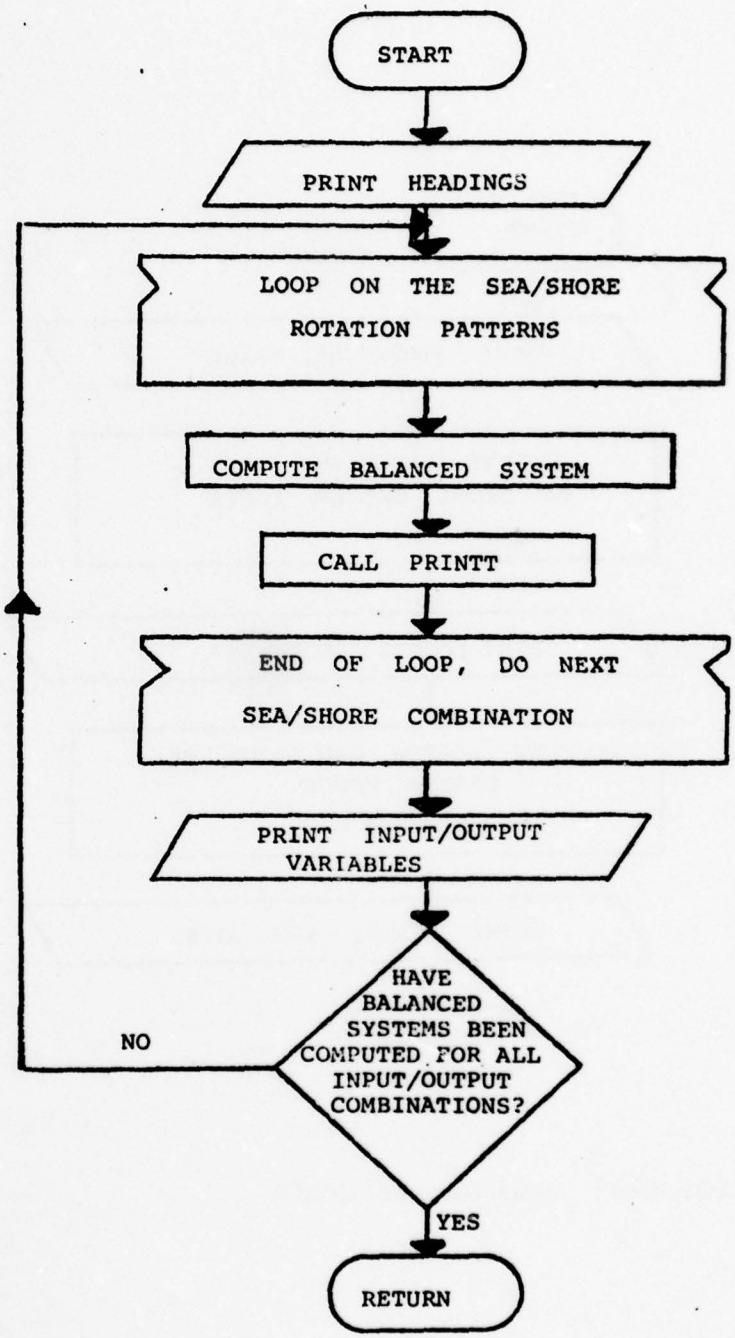

FIG. B-2: Subroutine BALANZ

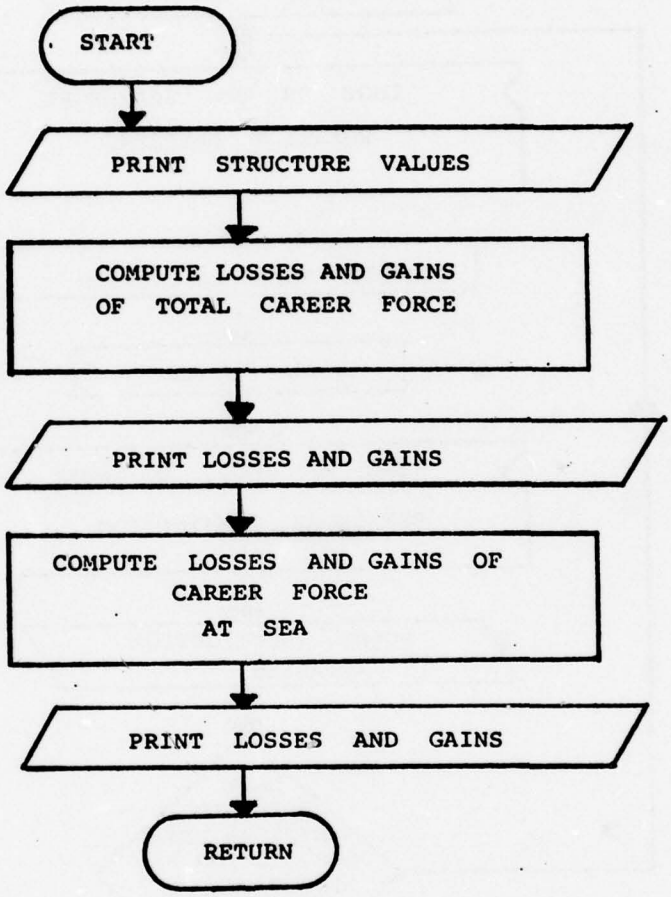

FIG. B-3: Subroutine CHECK

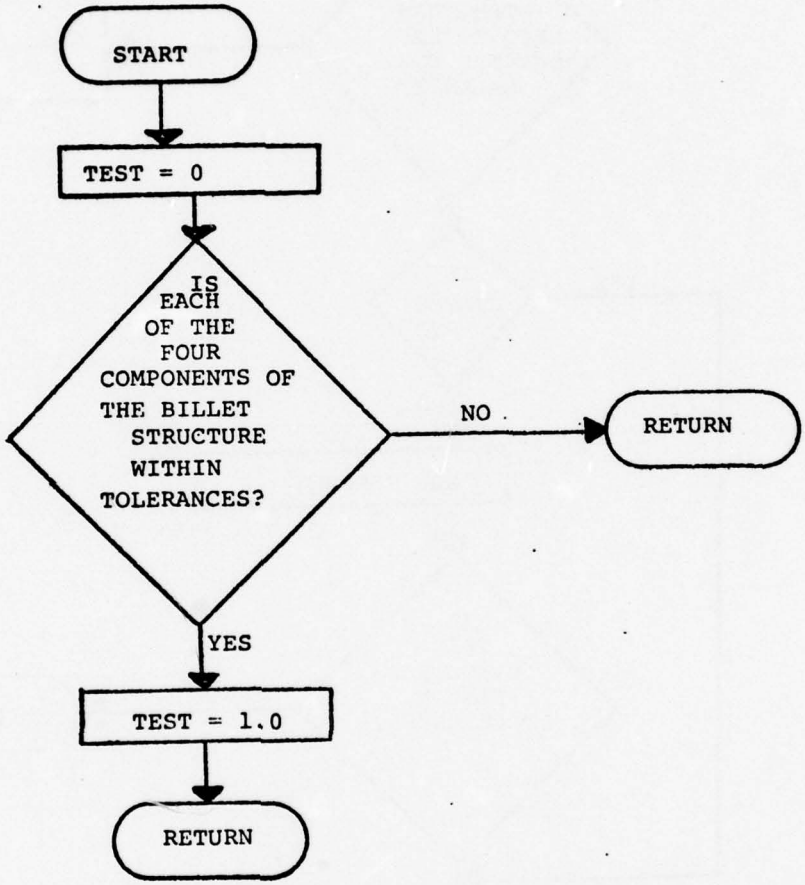

FIG. B-4: Subroutine FEASBL

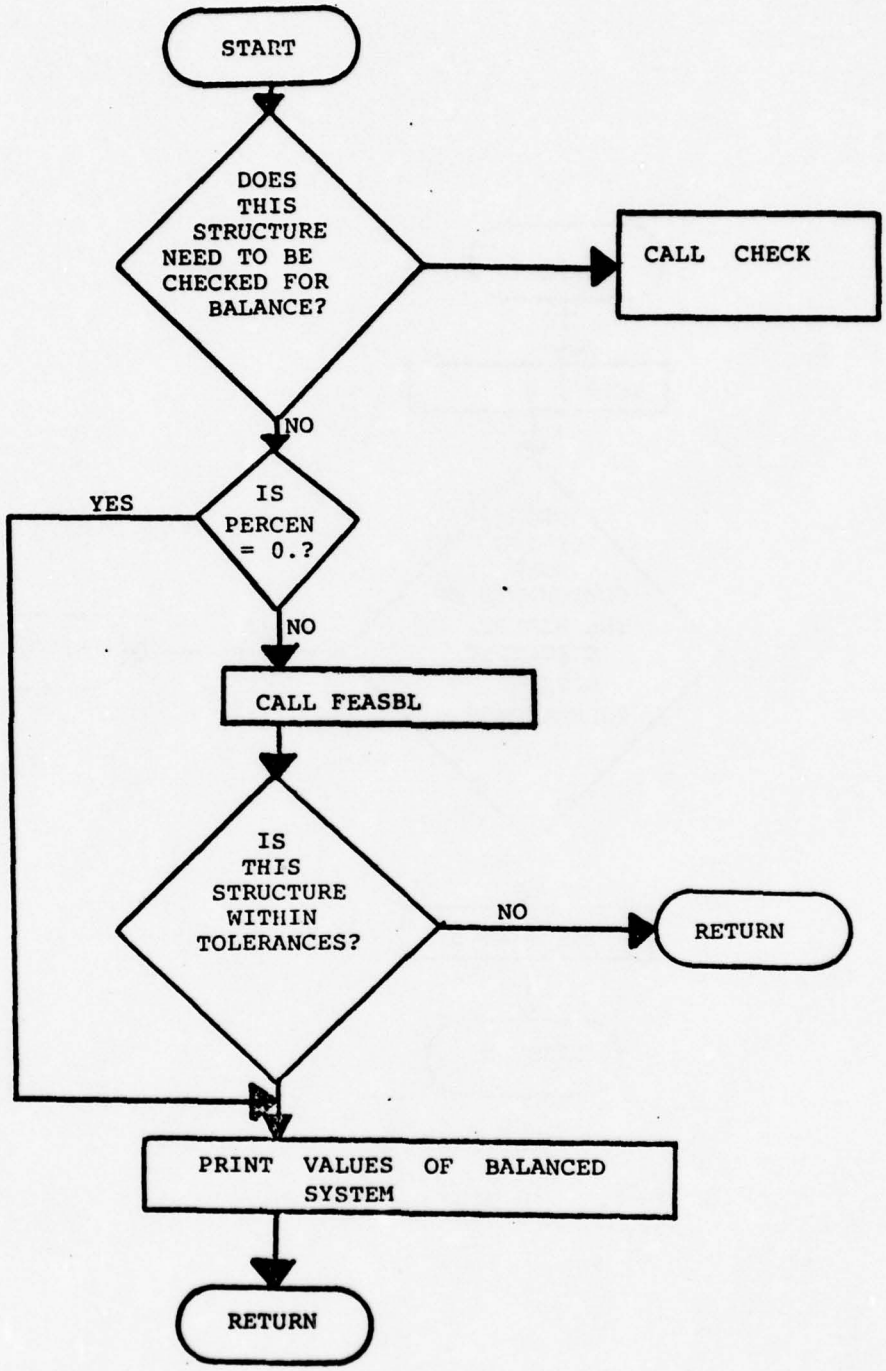

FIG. B-5: Subroutine PRINTT

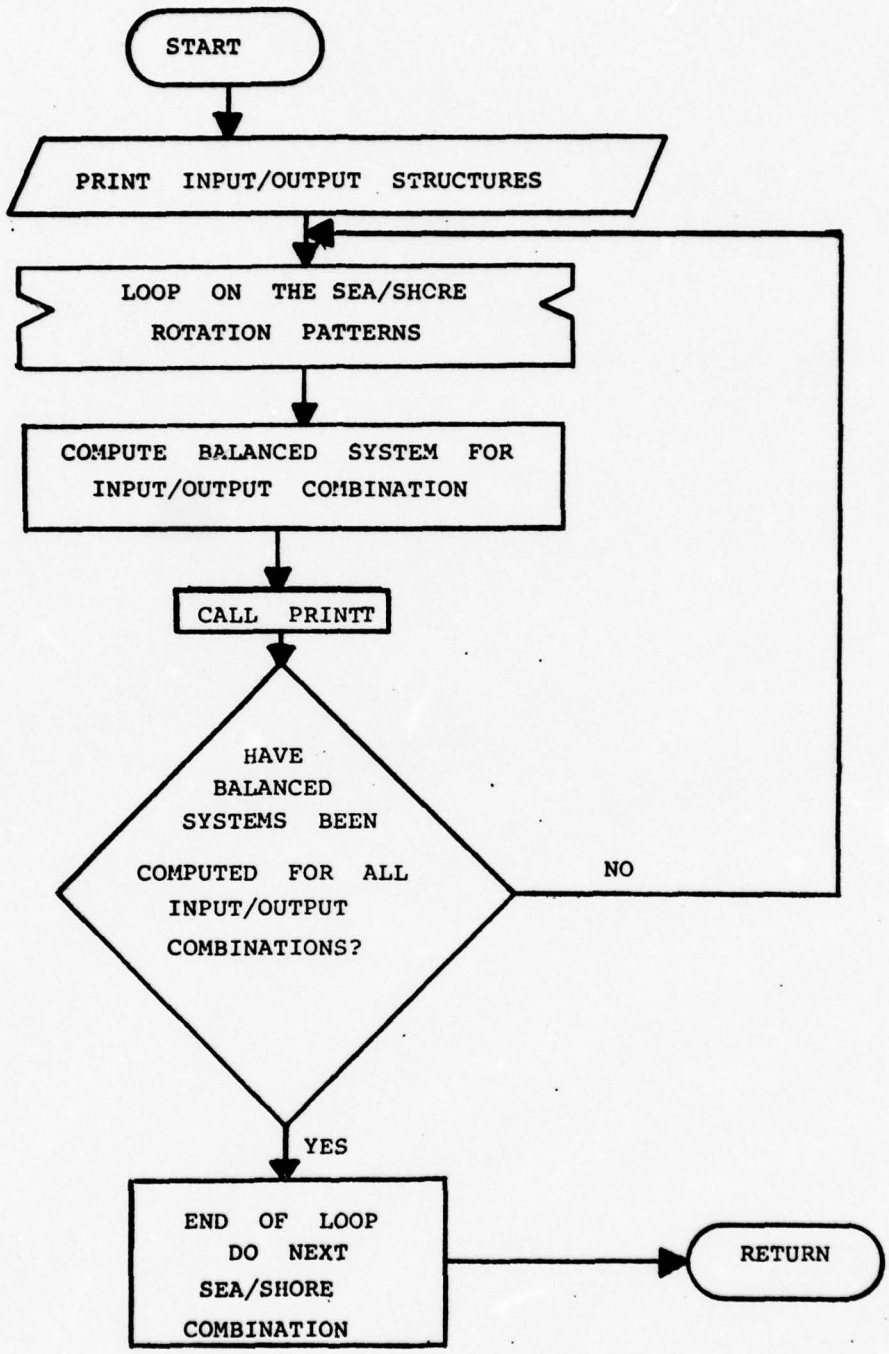

FIG. B-6: Subroutine ROTATE

APPENDIX C

SAMPLE OUTPUTS

The figures in this appendix are examples of the kinds of printed output that can be produced by MOSES.

Figures C-1, C-2 and C-3 present the balanced structures calculated by MOSES for three different input data sets.

The user has supplied values for only seven variables for the output in figure C-1. They were ALPHA, T1, T2, S1, S2, C and R. The other 19 initial parameters assumed their default values.

The user-specified values for for nine variables for Figure C-2: the seven for figure C-1, plus SEATIM and PERCEN. The other 17 parameters assumed their default values.

The user-specified values for 11 variables for figure C-3: the nine for figure C-2, plus T2MAX and S2MAX. The other 15 variables assumed default values.

```
PROGRAM PARAMETERS((  T1=  144835.00   T2=  35550.00   S1=  74612.00   S2=  51150.00   C=  0.8600000   P=  0.09345
   T1T2=  180385.00   T1S1=  219447.00   T2S2=  86700.00   S1S2=  125770.00   A=  3.000000   B=  2.000
   PERICC=  4.00   EPS=  0.0001000   SEATIM=  9.00   SHDTIM=  5.00   PERCEN=  0.0600000   TIMIN=  0.
   T1MAX=  0.00   T2MIN=  0.00   T2MAX=  0.00   S1MIN=  0.00   S1MAX=  0.00   S2MIN=  0.
   S2MAX=  0.00   ALPHA=  2.
```

SUMMARY OF INPUT AND OUTPUT VARIABLES FOR LINES A-J ARE:

A GIVEN: FIRST-TERM SEA BILLETS, CAREER SEA BILLETS, CAREER CONTINUATION RATE, AND FIRST-TERM RETENTION RATE
SOLVE FOR: FIRST-TERM SHORE BILLETS AND CAREER SHORE BILLETS

B GIVEN: CAREER SEA BILLETS, CAREER SHORE BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE
SOLVE FOR: FIRST-TERM SHORE BILLETS AND FIRST-TERM SEA BILLETS

C GIVEN: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE
SOLVE FOR: CAREER SEA BILLETS AND CAREER SHORE BILLETS

D GIVEN: FIRST-TERM SHORE BILLETS, TOTAL SEA BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE
SOLVE FOR: FIRST-TERM SEA BILLETS, CAREER SEA BILLETS AND CAREER SHORE BILLETS

E GIVEN: FIRST TERM SHORE BILLETS EQUAL TO ZERO, TOTAL SEA BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE
SOLVE FOR: FIRST-TERM SEA BILLETS, CAREER SEA BILLETS AND CAREER SHORE BILLETS

F GIVEN: TOTAL SEA BILLETS, TOTAL SHORE BILLETS, CAREER CONTINUATION RATE AND FIRST TERM RETENTION RATE
SOLVE FOR: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS, CAREER SHORE BILLETS AND CAREER SEA BILLETS

G GIVEN: CAREER SEA BILLETS, TOTAL FIRST-TERM BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE
SOLVE FOR: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS AND CAREER SHORE BILLETS

H GIVEN: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS, CAREER SEA BILLETS AND CAREER CONTINUATION RATE
SOLVE FOR: CAREER SHORE BILLETS AND FIRST-TERM RETENTION RATE

I GIVEN: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS, CAREER SEA BILLETS AND FIRST-TERM RETENTION RATE
SOLVE FOR: CAREER SHORE BILLETS AND CAREER CONTINUATION RATE

J GIVEN: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS, CAREER SEA BILLETS AND CAREER SHORE BILLETS
SOLVE FOR: FIRST-TERM RETENTION RATE AND CAREER CONTINUATION RATE

FIG. C-1: Sample Output - 7 User Specified Variables

	SEA DUTY YRS	SHORE DUTY YRS	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS			125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	12.	8.	133274.	199662.	219447.	113489.	54827.	144835.	74612.	58662.	0.8600	0.0935
B	12.	8.	125770.	188629.	174116.	140074.	88916.	99504.	74612.	51158.	0.8600	0.0935
C	12.	8.	120407.	180385.	210663.	90129.	35550.	144835.	65828.	54579.	0.8600	0.0935
D	12.	8.	124774.	186927.	219447.	92254.	35550.	151377.	69070.	56704.	0.8600	0.0935
E	12.	8.	109097.	163442.	219447.	53092.	0.	163442.	56035.	53092.	0.8600	0.0935
F	12.	8.	122553.	183602.	219447.	86708.	30516.	153386.	66351.	56192.	0.8600	0.0935
G	12.	8.	120407.	180385.	141718.	155074.	113279.	67106.	74612.	45795.	0.8600	0.0935
H	12.	8.	136473.	180385.	219447.	97411.	35550.	144835.	74612.	61861.	0.8600	0.1059
I	12.	8.	135064.	180385.	219447.	95642.	35550.	144835.	74612.	60392.	0.8751	0.0935
J	12.	8.	125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.9815	0.0129
USER INPUTS			125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	12.	9.	139500.	206929.	219447.	126242.	64154.	144835.	74612.	64888.	0.8600	0.0935
B	12.	9.	125770.	185419.	144464.	169725.	118567.	69852.	74612.	51158.	0.8600	0.0935
C	12.	9.	120407.	180385.	206838.	93954.	35550.	144835.	62003.	58404.	0.8600	0.0935
D	12.	9.	126784.	189930.	219447.	92275.	35550.	154380.	65059.	61725.	0.8600	0.0935
E	12.	9.	113979.	166261.	219447.	57793.	0.	166261.	53186.	57793.	0.8600	0.0935
F	12.	9.	122554.	183601.	219447.	86708.	26035.	157566.	61861.	60673.	0.8600	0.0935
G	12.	9.	120407.	180385.	115176.	185616.	139821.	40564.	74612.	45795.	0.8600	0.0935
H	12.	9.	144893.	180385.	219447.	105831.	35550.	144835.	74612.	70281.	0.8600	0.1125
I	12.	9.	142427.	180385.	219447.	103365.	35550.	144835.	74612.	67815.	0.8817	0.0935
J	12.	9.		NO FEASIBLE SOLUTION			35550.	144835.	74612.	51158.	1.0000	0.0000
USER INPUTS			125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	12.	10.	145508.	217989.	219447.	144050.	73154.	144835.	74612.	70896.	0.8600	0.0935
B	12.	10.	125770.	188419.	120788.	193401.	142243.	46176.	74612.	51158.	0.8600	0.0935
C	12.	10.	120407.	180385.	203376.	97416.	35550.	144835.	58541.	61866.	0.8600	0.0935
D	12.	10.	128664.	192754.	219447.	101971.	35550.	157204.	62243.	66421.	0.8600	0.0935
E	12.	10.	112739.	168858.	219447.	62190.	0.	168898.	50549.	62190.	0.8600	0.0935
F	12.	10.	122554.	183601.	219447.	86708.	21910.	161691.	57756.	64793.	0.8600	0.0935
G	12.	10.	120407.	180385.	93982.	206810.	161015.	19370.	74612.	45795.	0.8600	0.0935
H	12.	10.	153463.	180385.	219447.	114401.	35550.	144835.	74612.	78851.	0.8600	0.1191
I	12.	10.	149832.	180385.	219447.	110770.	35550.	144835.	74612.	75220.	0.8875	0.0935
J	12.	10.		NO FEASIBLE SOLUTION			35550.	144835.	74612.	51158.	1.0000	0.0000
USER INPUTS			125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	12.	11.	151305.	226675.	219447.	158533.	81940.	144835.	74612.	76693.	0.8600	0.0935
B	12.	11.	125770.	188419.	101458.	212731.	161573.	26846.	74612.	51158.	0.8600	0.0935
C	12.	11.	120407.	180385.	260225.	100563.	35550.	144835.	55394.	65013.	0.8600	0.0935
D	12.	11.	130424.	195393.	219447.	108370.	35550.	159843.	59604.	70820.	0.8600	0.0935
E	12.	11.	114388.	171368.	219447.	66309.	0.	171368.	48679.	66309.	0.8600	0.0935
F	12.	11.	122554.	183601.	219447.	86708.	18102.	165499.	53948.	68606.	0.8600	0.0935
G	12.	11.	120407.	180385.	76678.	224114.	178319.	2066.	74612.	45795.	0.8600	0.0935
H	12.	11.	162180.	180385.	219447.	123118.	35550.	144835.	74612.	87568.	0.8600	0.1259
I	12.	11.	157230.	180385.	219447.	118168.	35550.	144835.	74612.	82618.	0.8928	0.0935
J	12.	11.		NO FEASIBLE SOLUTION			35550.	144835.	74612.	51158.	1.0000	0.0000

FIG. C-1 (Continued)

	SEA DUTY TOUR	SHORE DUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	12.	12.	156900.	235056.	219447.	172509.	90221.	144835.	74612.	82288.	0.8600	0.0935
B	12.	12.	125770.	188420.	85387.	228093.	177645.	10775.	74612.	51158.	0.8600	0.0935
C	12.	12.	120407.	180385.	197358.	111434.	35550.	144835.	52523.	67884.	0.8600	0.0935
D	12.	12.	132077.	197867.	219447.	110457.	35550.	162317.	57130.	74947.	0.8600	0.0935
E	12.	12.	115935.	173685.	219447.	70173.	0.	173685.	45762.	70173.	0.8600	0.0555
F	12.	12.	122554.	183601.	219447.	88708.	14577.	169024.	50423.	72131.	0.8600	0.0935
G	12.	12.	120407.	180386.	62292.	236501.	192706.	-12321.	74612.	45795.	0.8600	0.0935
H	12.	12.	171044.	180385.	219447.	131582.	35550.	144835.	74612.	96432.	0.8600	0.1328
I	12.	12.	164617.	180385.	219447.	125555.	35550.	144835.	74612.	90005.	0.8976	0.0935
J	12.	12.		NO FEASIBLE	SOLUTION		35550.	144835.	74612.	51158.	1.0000	0.0900
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	13.	8.	129999.	194795.	219447.	105307.	49920.	144835.	74612.	55387.	0.8600	0.0935
B	13.	8.	125770.	188420.	193899.	120291.	69133.	119287.	74612.	51158.	0.8600	0.0935
C	13.	8.	120407.	180385.	212697.	88095.	35550.	144835.	67862.	52545.	0.8600	0.0935
D	13.	8.	123737.	185373.	219447.	85663.	35550.	149823.	69624.	54113.	0.8600	0.0935
E	13.	8.	108245.	162163.	219447.	50961.	0.	162163.	57284.	50961.	0.8600	0.0935
F	13.	8.	122554.	183601.	219447.	88708.	32836.	150765.	68682.	53872.	0.8600	0.0935
G	13.	8.	120407.	180385.	161502.	139290.	93495.	86890.	74612.	45795.	0.8600	0.0935
H	13.	8.	132384.	180385.	219447.	93322.	35550.	144835.	74612.	57772.	0.8600	0.1027
I	13.	8.	131273.	180385.	219447.	92211.	35550.	144835.	74612.	56661.	0.8716	0.0935
J	13.	8.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.9333	0.0466
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	13.	9.	135877.	203562.	219447.	115992.	58727.	144835.	74612.	61265.	0.8600	0.0935
B	13.	9.	125770.	188420.	164248.	145942.	58784.	89636.	74612.	51158.	0.8600	0.0935
C	13.	9.	120407.	180385.	208892.	91590.	35550.	144835.	64057.	56350.	0.8600	0.0935
D	13.	9.	125703.	188318.	219447.	94574.	35550.	152768.	66678.	59026.	0.8600	0.0935
E	13.	9.	110095.	164937.	219447.	55585.	0.	164937.	54510.	55585.	0.8600	0.0935
F	13.	9.	122554.	183601.	219447.	88708.	28378.	155223.	64224.	58330.	0.8600	0.0935
G	13.	9.	120407.	180385.	134959.	165833.	120538.	60347.	74612.	45795.	0.8600	0.0935
H	13.	9.	140247.	180385.	219447.	101185.	35550.	144835.	74612.	65635.	0.8600	0.1088
I	13.	9.	138219.	180385.	219447.	99157.	35550.	144835.	74612.	63607.	0.8788	0.0935
J	13.	9.		NO FEASIBLE	SOLUTION		35550.	144835.	74612.	51158.	1.0000	0.0900
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	13.	10.	141550.	212060.	219447.	134163.	67225.	144835.	74612.	66938.	0.8600	0.0935
B	13.	10.	125770.	188420.	140572.	173618.	122460.	65960.	74612.	51158.	0.8600	0.0935
C	13.	10.	120407.	180385.	205434.	95358.	35550.	144835.	60599.	59808.	0.8600	0.0935
D	13.	10.	127548.	191064.	219447.	95185.	35550.	155534.	63913.	63635.	0.8600	0.0935
E	13.	10.	111834.	167541.	219447.	59928.	0.	167541.	51906.	59928.	0.8600	0.0935
F	13.	10.	122554.	183601.	219447.	88708.	24251.	159350.	60097.	62457.	0.8600	0.0935
G	13.	10.	120407.	180385.	113765.	187027.	141232.	39153.	74612.	45795.	0.8600	0.0935
H	13.	10.	148256.	180385.	219447.	101188.	35550.	144835.	74612.	73638.	0.8600	0.1151
I	13.	10.	145152.	180385.	219447.	100090.	35550.	144835.	74612.	70540.	0.8839	0.0935
J	13.	10.		NO FEASIBLE	SOLUTION		35550.	144835.	74612.	51158.	1.0000	0.0900

FIG. C-1 (Continued)

	SEA CUTY TOUR	SHORE CUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	13.	11.	147024.	220260.	219447.	147837.	75425.	144835.	74612.	72412.	0.8600	0.0935
B	13.	11.	125770.	188419.	121241.	192948.	141790.	46629.	74612.	51158.	0.8600	0.0935
C	13.	11.	120407.	180385.	202279.	98513.	35550.	144835.	57444.	62583.	0.8600	0.0935
D	13.	11.	129283.	193684.	219447.	103520.	35550.	158134.	61313.	67570.	0.8600	0.0935
E	13.	11.	113468.	169990.	219447.	64011.	0.	169990.	49457.	64011.	0.8600	0.0935
F	13.	11.	122553.	183602.	219447.	88708.	20423.	163179.	56268.	66285.	0.8600	0.0935
G	13.	11.	120407.	180385.	96461.	244331.	150536.	21049.	74612.	45795.	0.8600	0.0935
H	13.	11.	156392.	180385.	219447.	117330.	35550.	144835.	74612.	81780.	0.8600	0.1214
I	13.	11.	352070.	180385.	219447.	113008.	35550.	144835.	74612.	77458.	0.8891	0.0935
J	13.	11.		NO FEASIBLE	SOLUTION		35550.	144835.	74612.	51158.	1.0000	0.0000
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	13.	12.	152306.	228174.	219447.	161033.	83339.	144835.	74612.	77694.	0.8600	0.0935
B	13.	12.	125770.	188420.	105170.	208920.	157862.	30358.	74612.	51158.	0.8600	0.0935
C	13.	12.	120407.	180385.	199392.	101400.	35550.	144835.	54557.	65850.	0.8600	0.0935
D	13.	12.	130918.	196131.	219447.	107602.	35550.	160581.	58856.	72052.	0.8600	0.0935
E	13.	12.	115006.	172295.	219447.	67854.	0.	172295.	47152.	67854.	0.8600	0.0935
F	13.	12.	122553.	183602.	219447.	88708.	16863.	166739.	52708.	69845.	0.8600	0.0935
G	13.	12.	120407.	180385.	82074.	218718.	172923.	7462.	74612.	45795.	0.8600	0.0935
H	13.	12.	164670.	180385.	219447.	125608.	35550.	144835.	74612.	90058.	0.8600	0.1278
I	13.	12.	158980.	180385.	219447.	119918.	35550.	144835.	74612.	84368.	0.8940	0.0935
J	13.	12.		NO FEASIBLE	SOLUTION		35550.	144835.	74612.	51158.	1.0000	0.0000
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	14.	8.	127200.	190502.	219447.	98315.	45727.	144835.	74612.	52588.	0.8600	0.0935
B	14.	8.	125770.	188420.	210810.	103380.	52222.	136198.	74612.	51158.	0.8600	0.0935
C	14.	8.	120407.	180385.	214537.	88255.	35550.	144835.	69732.	50705.	0.8600	0.0935
D	14.	8.	122812.	183988.	219447.	87353.	35550.	148438.	71039.	51803.	0.8600	0.0935
E	14.	8.	107483.	161024.	219447.	49060.	0.	161024.	58423.	49060.	0.8600	0.0935
F	14.	8.	122553.	183602.	219447.	88708.	34952.	148650.	70797.	51756.	0.8600	0.0935
G	14.	8.	120407.	180385.	178412.	122380.	76585.	103800.	74612.	45795.	0.8600	0.0935
H	14.	8.	128885.	180385.	219447.	85827.	35550.	144835.	74612.	54277.	0.8600	0.1000
I	14.	8.	128389.	180385.	219447.	85027.	35550.	144835.	74612.	53477.	0.8684	0.0935
J	14.	8.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8936	0.0742
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	14.	9.	132781.	198523.	219447.	112257.	54088.	144835.	74612.	58169.	0.8600	0.0935
B	14.	9.	125770.	188419.	181158.	133031.	81873.	106546.	74612.	51158.	0.8600	0.0935
C	14.	9.	120407.	180385.	210758.	90034.	35550.	144835.	65923.	54484.	0.8600	0.0935
D	14.	9.	124725.	186860.	219447.	92156.	35550.	151310.	68129.	56606.	0.8600	0.0935
E	14.	9.	109304.	163752.	219447.	53609.	0.	163752.	55695.	53609.	0.8600	0.0935
F	14.	9.	122553.	183602.	219447.	88708.	30526.	153076.	66371.	56182.	0.8600	0.0935
G	14.	9.	120407.	180385.	151070.	148522.	103127.	77258.	74612.	45795.	0.8600	0.0935
H	14.	9.	136276.	180385.	219447.	97214.	35550.	144835.	74612.	61664.	0.8600	0.1058
I	14.	9.	134630.	180385.	219447.	95568.	35550.	144835.	74612.	60018.	0.8748	0.0935
J	14.	9.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.9634	0.0256

FIG. C-1 (Continued)

	SEA DUTY TOUR	SHORE DUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	14.	10.	138167.	206951.	219447.	125711.	62156.	144835.	74612.	63555.	0.8600	0.0935
B	14.	16.	125770.	188419.	197482.	136707.	105549.	82870.	74612.	51158.	0.8600	0.0935
C	14.	10.	120407.	180385.	207311.	93481.	35550.	144835.	62476.	57931.	0.8600	0.0935
D	14.	10.	126546.	185573.	219447.	96682.	35550.	154033.	65414.	61132.	0.8600	0.0935
E	14.	10.	111020.	166322.	219447.	57895.	0.	166322.	53125.	57895.	0.8600	0.0935
F	14.	10.	122554.	183601.	219447.	88708.	26408.	157193.	62254.	60300.	0.8600	0.0935
G	14.	10.	120407.	180385.	130676.	170116.	124321.	56364.	74612.	45795.	0.8600	0.0935
H	14.	10.	143795.	180385.	219447.	104733.	35550.	144835.	74612.	69183.	0.8600	0.1116
I	14.	10.	141155.	180385.	219447.	102093.	35550.	144835.	74612.	66543.	0.8806	0.0935
J	14.	10.		NO FEASIBLE SOLUTION			35550.	144835.	74612.	51158.	1.0000	0.0000
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	14.	11.	143364.	214778.	219447.	130695.	69943.	144835.	74612.	68752.	0.8600	0.0935
B	14.	11.	125770.	188420.	138152.	176038.	124880.	63540.	74612.	51158.	0.8600	0.0935
C	14.	11.	120407.	180385.	204156.	96636.	35550.	144835.	59321.	61086.	0.8600	0.0935
D	14.	11.	128256.	192143.	219447.	100552.	35550.	156593.	62854.	65402.	0.8600	0.0935
E	14.	11.	112639.	168747.	219447.	61939.	0.	168747.	50700.	61939.	0.8600	0.0935
F	14.	11.	122553.	183602.	219447.	88708.	22571.	161031.	58416.	64137.	0.8600	0.0935
G	14.	11.	120407.	180385.	113372.	187420.	141625.	38760.	74612.	45795.	0.8600	0.0935
H	14.	11.	151444.	180385.	219447.	112382.	35550.	144835.	74612.	76832.	0.8600	0.1175
I	14.	11.	147667.	180385.	219447.	106605.	35550.	144835.	74612.	73055.	0.8859	0.0935
J	14.	11.		NO FEASIBLE SOLUTION			35550.	144835.	74612.	51158.	1.0000	0.0000
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	14.	12.	148379.	222291.	219447.	151223.	77456.	144835.	74612.	73767.	0.8600	0.0935
B	14.	12.	125770.	188420.	122081.	192109.	140951.	47469.	74612.	51158.	0.8600	0.0935
C	14.	12.	120407.	180385.	201259.	99533.	35550.	144835.	56424.	63983.	0.8600	0.0935
D	14.	12.	129870.	194561.	219447.	104984.	35550.	159011.	60436.	69434.	0.8600	0.0935
E	14.	12.	114167.	171037.	219447.	65757.	0.	171037.	48410.	65757.	0.8600	0.0935
F	14.	12.	122554.	183601.	219447.	88708.	18987.	164614.	54833.	67721.	0.8600	0.0935
G	14.	12.	120407.	180385.	98985.	201807.	156012.	24373.	74612.	45795.	0.8600	0.0935
H	14.	12.	159221.	180385.	219447.	120159.	35550.	144835.	74612.	84609.	0.8600	0.1236
I	14.	12.	154166.	180385.	219447.	115104.	35550.	144835.	74612.	79554.	0.8907	0.0935
J	14.	12.		NO FEASIBLE SOLUTION			35550.	144835.	74612.	51158.	1.0000	0.0000
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	15.	8.	124781.	186938.	219447.	92272.	42103.	144835.	74612.	50169.	0.8600	0.0935
B	15.	8.	125770.	188419.	225422.	88767.	17609.	150810.	74612.	51158.	0.8600	0.0935
C	15.	8.	120407.	180385.	216210.	84582.	35550.	144835.	71375.	49032.	0.8600	0.0935
D	15.	8.	121983.	182745.	219447.	85281.	35550.	147195.	72252.	49731.	0.8600	0.0935
E	15.	8.	106801.	160001.	219447.	47355.	0.	160001.	59446.	47355.	0.8600	0.0935
F	15.	8.	122553.	183602.	219447.	88708.	36886.	146714.	72733.	49820.	0.8600	0.0935
G	15.	8.	120407.	180385.	193025.	107767.	61972.	118413.	74612.	45795.	0.8600	0.0935
H	15.	8.	125868.	180385.	219447.	88806.	35550.	144835.	74612.	51256.	0.8600	0.0977
I	15.	8.	125346.	180385.	219447.	88284.	35550.	144835.	74612.	50734.	0.8565	0.0935
J	15.	8.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8610	0.0969

FIG. C-1 (Continued)

	SEA DUTY TOUR	SHORE DUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	15.	9.	130105.	194914.	219447.	102572.	50079.	144835.	74612.	55493.	0.8600	0.0935
B	15.	9.	125770.	180419.	195771.	118418.	67260.	128559.	74612.	51158.	0.8600	0.0935
C	15.	9.	120407.	180385.	212461.	88331.	35550.	144835.	67626.	52781.	0.8600	0.0935
D	15.	9.	123864.	185564.	219447.	85981.	35550.	150314.	69433.	54431.	0.8600	0.0935
E	15.	9.	108592.	162685.	219447.	51830.	0.	162685.	56762.	51830.	0.8600	0.0935
F	15.	9.	122553.	183602.	219447.	88708.	32501.	151101.	68346.	54207.	0.8600	0.0935
G	15.	9.	120407.	180385.	166482.	134310.	88515.	91870.	74612.	45795.	0.8600	0.0935
H	15.	9.	112845.	169385.	219447.	93783.	35550.	144835.	74612.	58233.	0.8600	0.1031
I	15.	9.	131535.	180385.	219447.	92473.	35550.	144835.	74612.	56923.	0.8718	0.0935
J	15.	9.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.9280	0.0502
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	15.	10.	135243.	202612.	219447.	118408.	57777.	144835.	74612.	60631.	0.8600	0.0935
B	15.	10.	125770.	188419.	172095.	142094.	90936.	97603.	74612.	51158.	0.8600	0.0935
C	15.	10.	120407.	180385.	219030.	91762.	35550.	144835.	64195.	56212.	0.8600	0.0935
D	15.	10.	125642.	188220.	219447.	94423.	35550.	152678.	66769.	58873.	0.8600	0.0935
E	15.	10.	110285.	165222.	219447.	56060.	0.	165222.	54225.	56060.	0.8600	0.0935
F	15.	10.	122553.	183602.	219447.	88708.	28401.	155201.	64246.	58307.	0.8600	0.0935
G	15.	10.	120407.	180385.	145288.	155504.	109709.	70676.	74612.	45795.	0.8600	0.0935
H	15.	10.	139545.	180385.	219447.	100883.	35550.	144835.	74612.	65333.	0.8600	0.1066
I	15.	10.	137710.	180385.	219447.	98648.	35550.	144835.	74612.	63098.	0.8776	0.0935
J	15.	10.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.9852	0.0103
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	15.	11.	340202.	210040.	219447.	130795.	65205.	144835.	74612.	65590.	0.8600	0.0935
B	15.	11.	125770.	188420.	152765.	161425.	110267.	78153.	74612.	51158.	0.8600	0.0935
C	15.	11.	120407.	180385.	205879.	94913.	35550.	144835.	61044.	59363.	0.8600	0.0935
D	15.	11.	127325.	190748.	219447.	96626.	35550.	155198.	64249.	63076.	0.8600	0.0935
E	15.	11.	111888.	167622.	219447.	60083.	0.	167622.	51825.	60063.	0.8600	0.0935
F	15.	11.	122554.	183601.	219447.	88708.	24563.	159038.	69435.	62145.	0.8600	0.0935
G	15.	11.	120407.	180385.	127984.	172808.	127013.	53372.	74612.	45795.	0.8600	0.0935
H	15.	11.	147168.	180385.	219447.	108106.	35550.	144835.	74612.	72556.	0.8600	0.1142
I	15.	11.	143666.	180385.	219447.	104804.	35550.	144835.	74612.	69254.	0.8828	0.0935
J	15.	11.		NO FEASIBLE	SOLUTION		35550.	144835.	74612.	51158.	1.0000	0.0000
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	15.	12.	144986.	217208.	219447.	142747.	72373.	144835.	74612.	70374.	0.8600	0.0935
B	15.	12.	125770.	188419.	136693.	177496.	126338.	62081.	74612.	51158.	0.8600	0.0935
C	15.	12.	120407.	180385.	202978.	97814.	35550.	144835.	58143.	62264.	0.8600	0.0935
D	15.	12.	128918.	193135.	219447.	102606.	35550.	157585.	61862.	67056.	0.8600	0.0935
E	15.	12.	113405.	169895.	219447.	63853.	0.	169895.	49552.	63853.	0.8600	0.0935
F	15.	12.	122554.	183601.	219447.	88708.	20966.	162635.	56812.	65742.	0.8600	0.0935
G	15.	12.	120407.	180385.	113598.	187194.	141199.	38986.	74612.	45795.	0.8600	0.0935
H	15.	12.	154313.	180385.	219447.	115451.	35550.	144835.	74612.	79901.	0.8600	0.1199
I	15.	12.	150013.	180385.	219447.	110951.	35550.	144835.	74612.	75401.	0.8876	0.0935
J	15.	12.		NO FEASIBLE	SOLUTION		35550.	144835.	74612.	51158.	1.0000	0.0000

FIG. C-1 (Continued)

	SEA DUTY TOUR	SHORE DUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	16.	8.	122671.	183777.	219447.	87001.	38942.	144835.	74612.	48059.	0.8600	0.0935
B	16.	8.	125770.	188419.	238168.	76021.	24863.	163556.	74612.	51158.	0.8600	0.0935
C	16.	8.	120407.	180385.	217736.	83056.	35550.	144835.	72901.	47506.	0.8600	0.0935
D	16.	8.	121235.	181626.	219447.	83414.	35550.	146076.	73371.	47864.	0.8600	0.0935
E	16.	8.	106186.	159080.	219447.	45819.	0.	159080.	60367.	45819.	0.8600	0.0935
F	16.	8.	122554.	183601.	219447.	88708.	38665.	144936.	74511.	48043.	0.8600	0.0935
G	16.	8.	120407.	180385.	205771.	95021.	49226.	131159.	74612.	45795.	0.8600	0.0935
H	16.	8.	123234.	180385.	219447.	84172.	35550.	144835.	74612.	48822.	0.8600	0.0956
I	16.	8.	122959.	180385.	219447.	83897.	35550.	144835.	74612.	48347.	0.8629	0.0935
J	16.	8.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.1158
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	16.	9.	127771.	191618.	219447.	99742.	46583.	144835.	74612.	53159.	0.8600	0.0935
B	16.	9.	125770.	188420.	208537.	105673.	54515.	133905.	74612.	51158.	0.8600	0.0935
C	16.	9.	120407.	180385.	214620.	88772.	35550.	144835.	69185.	51222.	0.8600	0.0935
D	16.	9.	123077.	184384.	219447.	88014.	35550.	148834.	70613.	52464.	0.8600	0.0935
E	16.	9.	107949.	161721.	219447.	50223.	0.	161721.	57726.	50223.	0.8600	0.0935
F	16.	9.	122553.	183602.	219447.	88708.	34322.	149280.	73167.	52386.	0.8600	0.0935
G	16.	9.	120407.	180385.	179228.	121564.	75769.	104616.	74612.	45795.	0.8600	0.0935
H	16.	9.	129852.	180385.	219447.	50750.	35550.	144835.	74612.	55240.	0.8600	0.1008
I	16.	9.	128845.	180385.	219447.	85783.	35550.	144835.	74612.	54233.	0.8692	0.0935
J	16.	9.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8924	0.0709
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	16.	10.	132653.	192752.	219447.	112638.	53957.	144835.	74612.	58081.	0.8600	0.0935
B	16.	10.	125770.	188420.	184841.	129349.	78191.	110229.	74612.	51158.	0.8600	0.0935
C	16.	10.	120407.	180385.	210608.	90184.	35550.	144835.	65773.	54634.	0.8600	0.0935
D	16.	10.	124822.	186959.	219447.	92374.	35550.	151449.	67998.	56824.	0.8600	0.0935
E	16.	10.	109620.	164224.	219447.	54397.	0.	164224.	55223.	54397.	0.8600	0.0935
F	16.	10.	122554.	183601.	219447.	88708.	38246.	153355.	66092.	56462.	0.8600	0.0935
G	16.	10.	120407.	180385.	158034.	142758.	96963.	83422.	74612.	45795.	0.8600	0.0935
H	16.	10.	136567.	180385.	219447.	97525.	35550.	144835.	74612.	61975.	0.8600	0.1060
I	16.	10.	134716.	180385.	219447.	95648.	35550.	144835.	74612.	60098.	0.8749	0.0935
J	16.	10.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.9536	0.0324
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	16.	11.	137443.	205907.	219447.	123503.	61072.	144835.	74612.	62831.	0.8600	0.0935
B	16.	11.	125770.	188419.	165516.	148879.	57521.	90898.	74612.	51158.	0.8600	0.0935
C	16.	11.	120407.	180385.	207467.	93325.	35550.	144835.	62632.	57775.	0.8600	0.0935
D	16.	11.	126478.	189480.	219447.	96511.	35550.	153930.	65517.	60961.	0.8600	0.0935
E	16.	11.	111205.	166599.	219447.	58357.	0.	166599.	52848.	58357.	0.8600	0.0935
F	16.	11.	122554.	183601.	219447.	88708.	26416.	157185.	62262.	60292.	0.8600	0.0935
G	16.	11.	120407.	180385.	140730.	160062.	114267.	66118.	74612.	45795.	0.8600	0.0935
H	16.	11.	143429.	180385.	219447.	104377.	35550.	144835.	74612.	68827.	0.8600	0.1113
I	16.	11.	140559.	180385.	219447.	101497.	35550.	144835.	74612.	65947.	0.8801	0.0935
J	16.	11.		NO FEASIBLE SOLUTION			35550.	144835.	74612.	51158.	1.0000	0.0000

FIG. C-1 (Continued)

	SEA DUTY TOUR	SHORE DUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.6935
A	16.	12.	142026.	212774.	219447.	139353.	67939.	144835.	74612.	67414.	0.8600	0.6935
B	16.	12.	125770.	180419.	149439.	104750.	113592.	74827.	74612.	51158.	0.8600	0.6935
C	16.	12.	120407.	180385.	204565.	96227.	35550.	144835.	59730.	60677.	0.8600	0.6935
D	16.	12.	128650.	191836.	219447.	100439.	35550.	156286.	63161.	64889.	0.8600	0.8935
E	16.	12.	112710.	168854.	219447.	62117.	0.	168854.	50593.	62117.	0.8600	0.6535
F	16.	12.	122554.	183601.	219447.	88708.	22012.	160789.	58658.	63896.	0.8600	0.6935
G	16.	12.	120407.	180385.	126344.	174448.	128653.	51732.	74612.	45795.	0.8600	0.8935
H	16.	12.	150406.	180385.	219447.	111344.	35550.	144835.	74612.	75794.	0.8600	0.1167
I	16.	12.	146399.	180385.	219447.	107333.	35550.	144835.	74612.	71783.	0.8848	0.8935
J	16.	12.		NO FEASIBLE	SOLUTION		35550.	144835.	74612.	51158.	1.0000	0.0000
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.6935
A	17.	8.	120815.	180957.	219447.	82365.	36162.	144835.	74612.	46203.	0.8600	0.6935
B	17.	8.	125770.	188420.	249377.	64813.	113655.	174765.	74612.	51158.	0.8600	0.6935
C	17.	8.	120407.	180385.	219132.	81660.	35550.	144835.	74297.	46110.	0.8600	0.8935
D	17.	8.	120558.	180612.	219447.	81723.	35550.	145062.	74395.	46173.	0.8600	0.8935
E	17.	8.	105629.	158246.	219447.	44428.	0.	158246.	61231.	44428.	0.8600	0.6935
F	17.	8.	122554.	183601.	219447.	88708.	40301.	143300.	76147.	46407.	0.8600	0.8935
G	17.	8.	120407.	180385.	216979.	83813.	38018.	142367.	74612.	45795.	0.8600	0.8935
H	17.	8.	120917.	180385.	219447.	81855.	35550.	144835.	74612.	46305.	0.8600	0.6938
I	17.	8.	120667.	180385.	219447.	81805.	35550.	144835.	74612.	46255.	0.8605	0.6935
J	17.	8.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8113	0.1316
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.6935
A	17.	9.	125719.	180343.	219447.	94615.	43508.	144835.	74612.	51107.	0.8600	0.6935
B	17.	9.	125770.	180419.	219725.	94464.	43306.	145113.	74612.	51158.	0.8600	0.6935
C	17.	9.	120407.	180385.	215452.	85340.	35550.	144835.	70617.	49790.	0.8600	0.6935
D	17.	9.	122362.	183313.	219447.	88228.	35550.	147763.	71684.	50678.	0.8600	0.8935
E	17.	9.	107365.	160845.	219447.	48763.	0.	160845.	58612.	48763.	0.8600	0.6935
F	17.	9.	122554.	183601.	219447.	88708.	36005.	147596.	71851.	50703.	0.8600	0.6935
G	17.	9.	120407.	180385.	190437.	110355.	64566.	115825.	74612.	45795.	0.8600	0.6935
H	17.	9.	127220.	180385.	219447.	88158.	35550.	144835.	74612.	52608.	0.8600	0.6987
I	17.	9.	126484.	180385.	219447.	87422.	35550.	144835.	74612.	51872.	0.8667	0.8935
J	17.	9.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8723	0.8883
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.6935
A	17.	10.	130451.	195432.	219447.	106436.	50597.	144835.	74612.	55839.	0.8600	0.6935
B	17.	10.	125770.	188419.	196049.	118140.	66982.	121417.	74612.	51158.	0.8600	0.6935
C	17.	10.	120407.	180385.	212062.	88736.	35550.	144835.	67227.	53180.	0.8600	0.8935
D	17.	10.	124076.	185881.	219447.	90516.	35550.	150331.	69116.	54960.	0.8600	0.8935
E	17.	10.	109013.	163316.	219447.	52882.	0.	163316.	56131.	52882.	0.8600	0.6535
F	17.	10.	122554.	183601.	219447.	88708.	21958.	151643.	67804.	54750.	0.8600	0.8935
G	17.	10.	120407.	180385.	169243.	131549.	85754.	94631.	74612.	45795.	0.8600	0.6935
H	17.	10.	133634.	180385.	219447.	94572.	35550.	144835.	74612.	58822.	0.8600	0.1037
I	17.	10.	132079.	180385.	219447.	93017.	35550.	144835.	74612.	57467.	0.8724	0.8935
J	17.	10.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.9266	0.8512

FIG. C-1 (Continued)

	SEA DUTY TOUR	SHORE DUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	17.	11.	135017.	202273.	219447.	117843.	57438.	144835.	74612.	60405.	0.8600	0.0935
B	17.	11.	125770.	188419.	176719.	137470.	66312.	102107.	74612.	51158.	0.8600	0.0935
C	17.	11.	120407.	180385.	208932.	91663.	35550.	144835.	64097.	56310.	0.8600	0.0935
D	17.	11.	125706.	188323.	219447.	94582.	35550.	152773.	66674.	59032.	0.8600	0.0935
E	17.	11.	110581.	165666.	219447.	58800.	0.	165666.	53791.	56800.	0.8600	0.0935
F	17.	11.	122554.	183601.	219447.	88708.	28143.	155460.	63987.	58567.	0.8600	0.0935
G	17.	11.	120407.	180385.	151935.	144853.	103058.	77327.	74612.	45795.	0.8600	0.0935
H	17.	11.	140159.	180385.	219447.	101097.	35550.	144835.	74612.	65547.	0.8600	0.1088
I	17.	11.	137658.	180385.	219447.	98596.	35550.	144835.	74612.	63046.	0.8775	0.0935
J	17.	11.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.9729	0.0169
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	17.	12.	139424.	206875.	219447.	122852.	64040.	144835.	74612.	64812.	0.8600	0.0935
B	17.	12.	125770.	188420.	160648.	153542.	102384.	86036.	74612.	51158.	0.8600	0.0935
C	17.	12.	120407.	180385.	206035.	94757.	35550.	144835.	61200.	59207.	0.8600	0.0935
D	17.	12.	127256.	190647.	219447.	90656.	35550.	155097.	64354.	62906.	0.8600	0.0935
E	17.	12.	112074.	167902.	219447.	60529.	0.	167902.	51545.	60529.	0.8600	0.0935
F	17.	12.	122554.	183601.	219447.	88708.	24538.	159063.	60384.	62170.	0.8600	0.0935
G	17.	12.	120407.	180385.	137552.	163240.	117445.	62940.	74612.	45795.	0.8600	0.0935
H	17.	12.	146794.	180385.	219447.	107732.	35550.	144835.	74612.	72182.	0.8600	0.1139
I	17.	12.	143223.	180385.	219447.	104161.	35550.	144835.	74612.	68611.	0.8823	0.0935
J	17.	12.		NO FEASIBLE SOLUTION			35550.	144835.	74612.	51158.	1.0000	0.0000
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	18.	8.	119172.	172535.	219447.	78260.	33700.	144835.	74612.	44560.	0.8600	0.0935
B	18.	8.	125770.	188419.	259304.	54285.	3727.	184692.	74612.	51158.	0.8600	0.0935
C	18.	8.	120407.	180385.	220415.	80377.	35550.	144835.	75583.	44827.	0.8600	0.0935
D	18.	8.	119744.	179690.	219447.	80187.	35550.	144140.	75307.	44637.	0.8600	0.0935
E	18.	8.	105123.	157688.	219447.	43164.	0.	157688.	61959.	43164.	0.8600	0.0935
F	18.	8.	122554.	183601.	219447.	88708.	41812.	141789.	77658.	44896.	0.8600	0.0935
G	18.	8.	120407.	180385.	226907.	73885.	28090.	152295.	74612.	45795.	0.8600	0.0935
H	18.	8.	118865.	180385.	219447.	75803.	35550.	144835.	74612.	44253.	0.8600	0.0923
I	18.	8.	119318.	180385.	219447.	79556.	35550.	144835.	74612.	44406.	0.8584	0.0935
J	18.	8.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.7922	0.1449
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	18.	9.	123961.	185420.	219447.	90674.	40785.	144835.	74612.	49289.	0.8600	0.0935
B	18.	9.	125770.	188420.	229653.	84537.	33779.	155041.	74612.	51158.	0.8600	0.0935
C	18.	9.	120407.	180385.	216770.	84022.	35550.	144835.	72935.	48472.	0.8600	0.0935
D	18.	9.	121710.	182338.	219447.	84601.	35550.	146788.	72659.	49051.	0.8600	0.0935
E	18.	9.	106831.	160048.	219447.	47432.	0.	160048.	59399.	47432.	0.8600	0.0935
F	18.	9.	122554.	183601.	219447.	88708.	37565.	146036.	73411.	49143.	0.8600	0.0935
G	18.	9.	120407.	180385.	200384.	100428.	54633.	125752.	74612.	45795.	0.8600	0.0935
H	18.	9.	124888.	180385.	219447.	85826.	35550.	144835.	74612.	50276.	0.8600	0.0969
I	18.	9.	124396.	180385.	219447.	85334.	35550.	144835.	74612.	49784.	0.8645	0.0935
J	18.	9.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8521	0.1031

FIG. C-1 (Continued)

	SEA DUTY TOUR	SHORE DUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	10.	10.	128465.	192457.	219447.	101479.	47622.	144835.	74612.	53853.	0.8600	0.0935
B	10.	10.	125770.	188419.	209977.	100212.	57054.	131365.	74612.	51158.	0.8600	0.0935
C	10.	10.	120407.	180385.	213404.	87388.	35550.	144835.	68569.	51838.	0.8600	0.0935
D	10.	10.	123394.	184859.	219447.	88806.	35550.	149309.	70138.	53256.	0.8600	0.0935
E	10.	10.	108466.	162486.	219447.	51499.	0.	162486.	56961.	51499.	0.8600	0.0935
F	10.	10.	122553.	183602.	219447.	88708.	33951.	150351.	69396.	53157.	0.8600	0.0935
G	10.	10.	120407.	180385.	179170.	121622.	75827.	104558.	74612.	45795.	0.8600	0.0935
H	10.	10.	131018.	180385.	219447.	91556.	35550.	144835.	74612.	56406.	0.8600	0.1017
I	10.	10.	129753.	180385.	219447.	90691.	35550.	144835.	74612.	55141.	0.8701	0.0935
J	10.	10.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.9036	0.0672
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	10.	11.	132869.	195054.	219447.	112476.	54219.	144835.	74612.	58257.	0.8600	0.0935
B	10.	11.	125770.	188420.	188647.	127543.	76385.	112235.	74612.	51158.	0.8600	0.0935
C	10.	11.	120407.	180385.	210289.	90503.	35550.	144835.	65454.	54953.	0.8600	0.0935
D	10.	11.	124998.	187263.	219447.	92814.	35550.	151713.	67734.	57264.	0.8600	0.0935
E	10.	11.	110011.	164811.	219447.	55375.	0.	164811.	54636.	55375.	0.8600	0.0935
F	10.	11.	122554.	183601.	219447.	88708.	29752.	153849.	65598.	56956.	0.8600	0.0935
G	10.	11.	120407.	180385.	161666.	138926.	93131.	87254.	74612.	45795.	0.8600	0.0935
H	10.	11.	137255.	180385.	219447.	98193.	35550.	144835.	74612.	62643.	0.8600	0.1065
I	10.	11.	135095.	180385.	219447.	96033.	35550.	144835.	74612.	60483.	0.8752	0.0935
J	10.	11.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.9484	0.0360
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	10.	12.	137116.	205421.	219447.	123092.	60586.	144835.	74612.	62506.	0.8600	0.0935
B	10.	12.	125770.	188419.	170575.	143614.	92456.	95963.	74612.	51158.	0.8600	0.0935
C	10.	12.	120407.	180385.	207398.	93394.	35550.	144835.	62563.	57844.	0.8600	0.0935
D	10.	12.	126528.	189556.	219447.	98637.	35550.	154006.	65641.	61087.	0.8600	0.0935
E	10.	12.	111490.	167028.	219447.	59071.	0.	167028.	52619.	59071.	0.8600	0.0935
F	10.	12.	122554.	183601.	219447.	88708.	26154.	157447.	62000.	60554.	0.8600	0.0935
G	10.	12.	120407.	180385.	147480.	153312.	107517.	72868.	74612.	45795.	0.8600	0.0935
H	10.	12.	143596.	180385.	219447.	104534.	35550.	144835.	74612.	68984.	0.8600	0.1114
I	10.	12.	140415.	180385.	219447.	101353.	35550.	144835.	74612.	65803.	0.8799	0.0935
J	10.	12.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.9877	0.0086
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	19.	8.	117707.	176340.	219447.	74600.	31505.	144835.	74612.	43095.	0.8600	0.0935
B	19.	8.	125770.	188420.	268153.	46637.	-51122.	193341.	74612.	51158.	0.8600	0.0935
C	19.	8.	120407.	180385.	221596.	75196.	35550.	144835.	76761.	43646.	0.8600	0.0935
D	19.	8.	119382.	178849.	219447.	78784.	35550.	143299.	76148.	43234.	0.8600	0.0935
E	19.	8.	104661.	156796.	219447.	42010.	0.	156796.	62651.	42010.	0.8600	0.0935
F	19.	8.	122554.	183601.	219447.	88708.	43210.	140391.	79056.	43498.	0.8600	0.0935
G	19.	8.	120407.	180385.	235756.	65636.	19241.	161144.	74612.	45795.	0.8600	0.0935
H	19.	8.	117036.	180385.	219447.	77974.	35550.	144835.	74612.	42424.	0.8600	0.0908
I	19.	8.	117377.	180385.	219447.	78315.	35550.	144835.	74612.	42765.	0.8564	0.0935
J	19.	8.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.7780	0.1562

FIG. C-1 (Continued)

	SEA DUTY TOUR	SHORE DUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	19.	9.	122281.	183152.	219447.	86626.	38357.	144835.	74612.	47669.	0.8600	0.0935
B	19.	9.	125770.	188419.	230502.	75687.	24529.	163890.	74612.	51158.	0.8600	0.0935
C	19.	9.	120407.	180385.	217987.	82805.	35550.	144835.	73152.	47255.	0.8600	0.0935
D	19.	9.	121115.	181445.	219447.	83113.	35550.	145895.	73552.	47563.	0.8600	0.0935
E	19.	9.	106345.	159318.	219447.	46216.	0.	159318.	60129.	46216.	0.8600	0.0935
F	19.	9.	122554.	183601.	219447.	88708.	39014.	144587.	74060.	47694.	0.8600	0.0935
G	19.	9.	120407.	180385.	209213.	91579.	45784.	134601.	74612.	45795.	0.8600	0.0935
H	19.	9.	122810.	180385.	219447.	83748.	35550.	144835.	74612.	48198.	0.8600	0.0951
I	19.	9.	122543.	180385.	219447.	83481.	35550.	144835.	74612.	47931.	0.8624	0.0935
J	19.	9.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8339	0.1158
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	19.	10.	126696.	185804.	219447.	97051.	44969.	144835.	74612.	52082.	0.8600	0.0935
B	19.	10.	125770.	180419.	214826.	95363.	48205.	140214.	74612.	51158.	0.8600	0.0935
C	19.	10.	120407.	180385.	214646.	88146.	35550.	144835.	69811.	50596.	0.8600	0.0935
D	19.	10.	122769.	183923.	219447.	87245.	35556.	148373.	71074.	51695.	0.8600	0.0935
E	19.	10.	107952.	161726.	219447.	50231.	0.	161726.	57721.	50231.	0.8600	0.0935
F	19.	10.	122553.	183602.	219447.	88708.	35035.	148567.	70880.	51673.	0.8600	0.0935
G	19.	10.	120407.	180385.	180619.	112773.	66978.	113407.	74612.	45795.	0.8600	0.0935
H	19.	10.	128687.	180385.	219447.	85625.	35550.	144835.	74612.	54075.	0.8600	0.0999
I	19.	10.	127687.	180385.	219447.	88625.	35550.	144835.	74612.	53075.	0.8600	0.0935
J	19.	10.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8834	0.0811
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	19.	11.	130954.	196185.	219447.	107692.	51350.	144835.	74612.	56342.	0.8600	0.0935
B	19.	11.	125770.	188420.	195496.	118694.	67536.	120884.	74612.	51158.	0.8600	0.0935
C	19.	11.	120407.	180385.	211547.	85245.	35550.	144835.	66712.	53695.	0.8600	0.0935
D	19.	11.	124348.	186290.	219447.	91191.	35550.	150740.	68707.	55641.	0.8600	0.0935
E	19.	11.	109487.	164026.	219447.	54066.	0.	164026.	55421.	54066.	0.8600	0.0935
F	19.	11.	122554.	183601.	219447.	88708.	31257.	152344.	67103.	55451.	0.8600	0.0935
G	19.	11.	120407.	180385.	170715.	138077.	84282.	96103.	74612.	45795.	0.8600	0.0935
H	19.	11.	134666.	180385.	219447.	95604.	35550.	144835.	74612.	60054.	0.8600	0.1045
I	19.	11.	132813.	180385.	219447.	93751.	35550.	144835.	74612.	58201.	0.8731	0.0935
J	19.	11.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.9272	0.0508
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	19.	12.	135064.	202343.	219447.	117960.	57508.	144835.	74612.	60452.	0.8600	0.0935
B	19.	12.	125770.	188419.	179424.	134765.	83607.	104812.	74612.	51158.	0.8600	0.0935
C	19.	12.	120467.	180385.	206666.	92126.	35556.	144835.	63831.	56576.	0.8600	0.0935
D	19.	12.	125859.	188551.	219447.	94563.	35550.	153001.	66446.	59413.	0.8600	0.0935
E	19.	12.	110954.	166223.	219447.	57730.	0.	166223.	53224.	57730.	0.8600	0.0935
F	19.	12.	122554.	183601.	219447.	88708.	27668.	155933.	63514.	59040.	0.8600	0.0935
G	19.	12.	120407.	180385.	156329.	144463.	98668.	81717.	74612.	45795.	0.8600	0.0935
H	19.	12.	140744.	180385.	219447.	101682.	35550.	144835.	74612.	66132.	0.8600	0.1098
I	19.	12.	137919.	180385.	219447.	98857.	35550.	144835.	74612.	63307.	0.8778	0.0935
J	19.	12.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.9654	0.0241

FIG. C-1 (Continued)

	SEA DUTY TOUR	SHORE DUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS			125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	20.	8.	116394.	174373.	219447.	71320.	29538.	144835.	74612.	41782.	0.8600	0.0935
B	20.	8.	125770.	180421.	276086.	38105.	-13054.	201474.	74612.	51158.	0.8600	0.0935
C	20.	8.	120407.	180385.	222687.	77105.	35550.	144835.	77852.	42555.	0.8600	0.0935
D	20.	8.	118868.	178080.	219447.	77501.	35550.	142530.	76917.	41951.	0.8600	0.0935
E	20.	8.	104239.	156162.	219447.	40954.	0.	156162.	63285.	40954.	0.8600	0.0935
F	20.	8.	122554.	183601.	219447.	86708.	44506.	139095.	80352.	42202.	0.8600	0.0935
G	20.	8.	120407.	180385.	243688.	57104.	11309.	169076.	74612.	45795.	0.8600	0.0935
H	20.	8.	115396.	180385.	219447.	78334.	35550.	144835.	74612.	40784.	0.8600	0.0896
I	20.	8.	115911.	180385.	219447.	78649.	35550.	144835.	74612.	41299.	0.8546	0.0935
J	20.	8.	125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.7621	0.1658
USER INPUTS			125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	20.	9.	120828.	181016.	219447.	82397.	36181.	144835.	74612.	46216.	0.8600	0.0935
B	20.	9.	125770.	188419.	246434.	67755.	16597.	171822.	74612.	51158.	0.8600	0.0935
C	20.	9.	120407.	180385.	219114.	81678.	35550.	144835.	74279.	46128.	0.8603	0.0935
D	20.	9.	120568.	180626.	219447.	81747.	35550.	145076.	74371.	46197.	0.8600	0.0935
E	20.	9.	105898.	158648.	219447.	45099.	0.	158648.	60799.	45099.	0.8600	0.0935
F	20.	9.	122553.	183602.	219447.	86708.	40363.	143239.	76228.	46345.	0.8600	0.0935
G	20.	9.	120407.	180385.	217146.	83646.	37851.	142534.	74612.	45795.	0.8600	0.0935
H	20.	9.	120947.	180385.	219447.	81885.	35550.	144835.	74612.	46335.	0.8600	0.0939
I	20.	9.	120887.	180385.	219447.	81825.	35550.	144835.	74612.	46275.	0.8606	0.0935
J	20.	9.	125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8183	0.1267
USER INPUTS			125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	20.	10.	125168.	187427.	219447.	93688.	42592.	144835.	74612.	50496.	0.8600	0.0935
B	20.	10.	125770.	188419.	222758.	91431.	40273.	148146.	74612.	51158.	0.8600	0.0935
C	20.	10.	120407.	180385.	215799.	84993.	35550.	144835.	70964.	49443.	0.8600	0.0935
D	20.	10.	122154.	183062.	219447.	85809.	35550.	147512.	71935.	50259.	0.8600	0.0935
E	20.	10.	107485.	161027.	219447.	69065.	0.	161027.	58420.	49065.	0.8600	0.0935
F	20.	10.	122554.	183661.	219447.	86708.	36420.	147181.	72266.	50288.	0.8600	0.0935
G	20.	10.	120407.	180385.	195952.	104840.	59045.	121340.	74612.	45795.	0.8600	0.0935
H	20.	10.	126597.	180385.	219447.	87535.	35550.	144835.	74612.	51985.	0.8600	0.0983
I	20.	10.	125841.	180385.	219447.	86779.	35550.	144835.	74612.	51229.	0.8661	0.0935
J	20.	10.	125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8666	0.0930
USER INPUTS			125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	20.	11.	129237.	193613.	219447.	103403.	48778.	144835.	74612.	54625.	0.8600	0.0935
B	20.	11.	125770.	188419.	203428.	110761.	59603.	128816.	74612.	51158.	0.8600	0.0935
C	20.	11.	120407.	180385.	212717.	88075.	35550.	144835.	67882.	52525.	0.8600	0.0935
D	20.	11.	123750.	185393.	219447.	85696.	35550.	149843.	69604.	54146.	0.8600	0.0935
E	20.	11.	109305.	163302.	219447.	52860.	0.	163302.	56145.	52860.	0.8600	0.0935
F	20.	11.	122554.	183601.	219447.	86708.	32666.	150935.	68512.	54042.	0.8600	0.0935
G	20.	11.	120407.	180385.	178648.	122144.	76349.	104036.	74612.	45795.	0.8600	0.0935
H	20.	11.	132345.	180385.	219447.	93283.	35550.	144835.	74612.	57733.	0.8600	0.1027
I	20.	11.	130774.	180385.	219447.	91712.	35550.	144835.	74612.	56162.	0.8711	0.0935
J	20.	11.	125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.9088	0.0636

FIG. C-1 (Continued)

	SEA DUTY TOUR	SHORE DUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS			125770.	180385.	219447.	66708.	35550.	144835.	74612.	51158.	0.8600	0.6935
A	20.	12.	133222.	199503.	219447.	113358.	54748.	144835.	74612.	58610.	0.8600	0.6935
B	20.	12.	125770.	180420.	187357.	120833.	75675.	112745.	74612.	51158.	0.8600	0.6935
C	20.	12.	120407.	180385.	209846.	90546.	35550.	144835.	65011.	55396.	0.8600	0.6935
D	20.	12.	125239.	187625.	219447.	93417.	35550.	152075.	67372.	57867.	0.8600	0.6935
E	20.	12.	110458.	165481.	219447.	58492.	0.	165481.	53966.	56492.	0.8600	0.6935
F	20.	12.	122553.	183602.	219447.	88708.	25091.	154511.	64936.	57617.	0.8600	0.8935
G	20.	12.	120407.	180385.	164261.	136531.	90736.	89649.	74612.	45795.	0.8600	0.6935
H	20.	12.	138188.	180385.	219447.	95126.	35550.	144835.	74612.	63576.	0.8600	0.1073
I	20.	12.	135689.	180385.	219447.	96627.	35550.	144835.	74612.	61077.	0.8758	0.6935
J	20.	12.	125770.	180385.	219447.	66708.	35550.	144835.	74612.	51158.	0.9459	0.6377

FIG. C-1 (Continued)

SEA DUTY TOUR	SHORE DUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS		125770.	190385.	219447.	66708.	35550.	144835.	74612.	51158.	0.8600	0.0935
12.	8.	133274.	195662.	219447.	113489.	54827.	144835.	74612.	58662.	0.8600	0.0935
12.	9.	139500.	200985.	219447.	120242.	56154.	144835.	74612.	64838.	0.8600	0.0935
12.	10.	145508.	206089.	219447.	126950.	73154.	144835.	74612.	70896.	0.8600	0.0935
12.	11.	151305.	210975.	219447.	133533.	81840.	144835.	74612.	76693.	0.8600	0.0935
12.	12.	156900.	215656.	219447.	139509.	90221.	144835.	74612.	82288.	0.8600	0.0935
13.	8.	129999.	194755.	219447.	105307.	49920.	144835.	74612.	55387.	0.8600	0.0935
13.	9.	135877.	200362.	219447.	115992.	58727.	144835.	74612.	61265.	0.8600	0.0935
13.	10.	141550.	205760.	219447.	124163.	67225.	144835.	74612.	66938.	0.8600	0.0935
13.	11.	147026.	210960.	219447.	142737.	75425.	144835.	74612.	72412.	0.8600	0.0935
13.	12.	152306.	215974.	219447.	151433.	83335.	144835.	74612.	77694.	0.8600	0.0935
14.	8.	127220.	190582.	219447.	98315.	45727.	144835.	74612.	52588.	0.8600	0.0935
14.	9.	132781.	196923.	219447.	112257.	54088.	144835.	74612.	58169.	0.8600	0.0935
14.	10.	138167.	206951.	219447.	125711.	62156.	144835.	74612.	63555.	0.8600	0.0935
14.	11.	143384.	214778.	219447.	138695.	69943.	144835.	74612.	68752.	0.8600	0.0935
14.	12.	148375.	222251.	219447.	151223.	77456.	144835.	74612.	73767.	0.8600	0.0935
15.	8.	124781.	188938.	219447.	92272.	42103.	144835.	74612.	50169.	0.8600	0.0935
15.	9.	130105.	194914.	219447.	105572.	50275.	144835.	74612.	55493.	0.8600	0.0935
15.	10.	135243.	202612.	219447.	118408.	57777.	144835.	74612.	60631.	0.8600	0.0935
15.	11.	140202.	210040.	219447.	130795.	65205.	144835.	74612.	65590.	0.8600	0.0935
15.	12.	144986.	217210.	219447.	142747.	72373.	144835.	74612.	70374.	0.8600	0.0935
16.	8.	122671.	183777.	219447.	87001.	38942.	144835.	74612.	48059.	0.8600	0.0935
16.	9.	127771.	191418.	219447.	99742.	46583.	144835.	74612.	53159.	0.8600	0.0935
16.	10.	132693.	198752.	219447.	112038.	53957.	144835.	74612.	58081.	0.8600	0.0935
16.	11.	137443.	205907.	219447.	123903.	61072.	144835.	74612.	62831.	0.8600	0.0935
16.	12.	142026.	212774.	219447.	135353.	67939.	144835.	74612.	67414.	0.8600	0.0935
17.	8.	120815.	180997.	219447.	82365.	36162.	144835.	74612.	46203.	0.8600	0.0935
17.	9.	125719.	188343.	219447.	94615.	43508.	144835.	74612.	51107.	0.8600	0.0935
17.	10.	130451.	195432.	219447.	106836.	50597.	144835.	74612.	55839.	0.8600	0.0935
17.	11.	135017.	202273.	219447.	117843.	57438.	144835.	74612.	60405.	0.8600	0.0935
17.	12.	139424.	208875.	219447.	128852.	64040.	144835.	74612.	64812.	0.8600	0.0935
18.	8.	119172.	178535.	219447.	78260.	33700.	144835.	74612.	44560.	0.8600	0.0935
18.	9.	123901.	185620.	219447.	90074.	40785.	144835.	74612.	49289.	0.8600	0.0935
18.	10.	128465.	192457.	219447.	101475.	47622.	144835.	74612.	53853.	0.8600	0.0935
18.	11.	132869.	199054.	219447.	112476.	54219.	144835.	74612.	58257.	0.8600	0.0935
18.	12.	137116.	205421.	219447.	123092.	60586.	144835.	74612.	62504.	0.8600	0.0935
19.	8.	117707.	176340.	219447.	74600.	31505.	144835.	74612.	43095.	0.8600	0.0935
19.	9.	122281.	183152.	219447.	88026.	38357.	144835.	74612.	47669.	0.8600	0.0935
19.	10.	126694.	189804.	219447.	97451.	44969.	144835.	74612.	52082.	0.8600	0.0935
19.	11.	130954.	196185.	219447.	107692.	51350.	144835.	74612.	56342.	0.8600	0.0935
19.	12.	135064.	202343.	219447.	117366.	57508.	144835.	74612.	60452.	0.8600	0.0935
20.	8.	116354.	174373.	219447.	71320.	29538.	144835.	74612.	41782.	0.8600	0.0935
20.	9.	120828.	181016.	219447.	82397.	36181.	144835.	74612.	46216.	0.8600	0.0935
20.	10.	125108.	187427.	219447.	93088.	42592.	144835.	74612.	50496.	0.8600	0.0935
20.	11.	129237.	193613.	219447.	103403.	48778.	144835.	74612.	54625.	0.8600	0.0935
20.	12.	133222.	199583.	219447.	113358.	54748.	144835.	74612.	58610.	0.8600	0.0935

GIVEN: FIRST-TERM SEA BILLETS, CAREER SEA BILLETS, CAREER CONTINUATION RATE, AND FIRST-TERM RETENTION RATE

.....THEN FOR THE VARIOUS ROTATION PATTERNS ABOVE.....AND A BALANCED SYSTEM

SOLVE FOR: FIRST-TERM SHORE BILLETS AND CAREER SHORE BILLETS

FIG. C-1 (Continued)

SEA DUTY TOUR	SHORE DUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS		125770.	100385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
12.	8.	125770.	100420.	174116.	140074.	88916.	99504.	74612.	51158.	0.8600	0.0935
12.	9.	125770.	100419.	144464.	169725.	118567.	69852.	74612.	51158.	0.8600	0.0935
12.	10.	125770.	100419.	120788.	193401.	142243.	46176.	74612.	51158.	0.8600	0.0935
12.	11.	125770.	100419.	101458.	212731.	161573.	26846.	74612.	51158.	0.8600	0.0935
12.	12.	125770.	100420.	85387.	228803.	177645.	10775.	74612.	51158.	0.8600	0.0935
13.	8.	125770.	100420.	193899.	120291.	69133.	119287.	74612.	51158.	0.8600	0.0935
13.	9.	125770.	100420.	164248.	149942.	98794.	89636.	74612.	51158.	0.8600	0.0935
13.	10.	125770.	100420.	140572.	173618.	122460.	65960.	74612.	51158.	0.8600	0.0935
13.	11.	125770.	100419.	121241.	192948.	141790.	46629.	74612.	51158.	0.8600	0.0935
13.	12.	125770.	100420.	105179.	209020.	157862.	30558.	74612.	51158.	0.8600	0.0935
14.	8.	125770.	100420.	210810.	103380.	52222.	136198.	74612.	51158.	0.8600	0.0935
14.	9.	125770.	100419.	181156.	133031.	81873.	106546.	74612.	51158.	0.8600	0.0935
14.	10.	125770.	100419.	157482.	156707.	105549.	82870.	74612.	51158.	0.8600	0.0935
14.	11.	125770.	100420.	138152.	176038.	124880.	63540.	74612.	51158.	0.8600	0.0935
14.	12.	125770.	100420.	122081.	192109.	140951.	47469.	74612.	51158.	0.8600	0.0935
15.	8.	125770.	100419.	225422.	88767.	37609.	150810.	74612.	51158.	0.8600	0.0935
15.	9.	125770.	100419.	195771.	118418.	67260.	121159.	74612.	51158.	0.8600	0.0935
15.	10.	125770.	100419.	172055.	142094.	90936.	97483.	74612.	51158.	0.8600	0.0935
15.	11.	125770.	100420.	152765.	161425.	110267.	78153.	74612.	51158.	0.8600	0.0935
15.	12.	125770.	100419.	136691.	177496.	126338.	62081.	74612.	51158.	0.8600	0.0935
16.	8.	125770.	100419.	238188.	76021.	24863.	163556.	74612.	51158.	0.8600	0.0935
16.	9.	125770.	100420.	208517.	105673.	54515.	133905.	74612.	51158.	0.8600	0.0935
16.	10.	125770.	100420.	184841.	129349.	78191.	110229.	74612.	51158.	0.8600	0.0935
16.	11.	125770.	100419.	165510.	148679.	97521.	90898.	74612.	51158.	0.8600	0.0935
16.	12.	125770.	100419.	149439.	164750.	113592.	74827.	74612.	51158.	0.8600	0.0935
17.	8.	125770.	100420.	249377.	64813.	13655.	174765.	74612.	51158.	0.8600	0.0935
17.	9.	125770.	100419.	219725.	94464.	43306.	145113.	74612.	51158.	0.8600	0.0935
17.	10.	125770.	100419.	196049.	118140.	66982.	121437.	74612.	51158.	0.8600	0.0935
17.	11.	125770.	100419.	176719.	137470.	86312.	102107.	74612.	51158.	0.8600	0.0935
17.	12.	125770.	100420.	160648.	153542.	102384.	86036.	74612.	51158.	0.8600	0.0935
18.	8.	125770.	100419.	259304.	54885.	3727.	184692.	74612.	51158.	0.8600	0.0935
18.	9.	125770.	100420.	229653.	84537.	33379.	155041.	74612.	51158.	0.8600	0.0935
18.	10.	125770.	100419.	205977.	108212.	57054.	131365.	74612.	51158.	0.8600	0.0935
18.	11.	125770.	100420.	186647.	127543.	76385.	112035.	74612.	51158.	0.8600	0.0935
18.	12.	125770.	100419.	170575.	143614.	92456.	95963.	74612.	51158.	0.8600	0.0935
19.	8.	125770.	100420.	268153.	46037.	-5122.	193341.	74612.	51158.	0.8600	0.0935
19.	9.	125770.	100419.	238502.	75687.	24529.	163690.	74612.	51158.	0.8600	0.0935
19.	10.	125770.	100419.	214826.	99363.	48205.	140014.	74612.	51158.	0.8600	0.0935
19.	11.	125770.	100420.	195496.	116694.	67536.	120684.	74612.	51158.	0.8600	0.0935
19.	12.	125770.	100419.	179424.	134765.	83607.	104612.	74612.	51158.	0.8600	0.0935
20.	8.	125770.	100421.	276086.	38105.	-13554.	201474.	74612.	51158.	0.8600	0.0935
20.	9.	125770.	100419.	246434.	67755.	16597.	171822.	74612.	51158.	0.8600	0.0935
20.	10.	125770.	100419.	222758.	91431.	40273.	148146.	74612.	51158.	0.8600	0.0935
20.	11.	125770.	100419.	203428.	110761.	59603.	128816.	74612.	51158.	0.8600	0.0935
20.	12.	125770.	100420.	187357.	126833.	75675.	112745.	74612.	51158.	0.8600	0.0935

GIVEN: CAREER SEA BILLETS, CAREER SHORE BILLETS, CARRER CONTINUATION RATE AND FIRST-TERM RETENTION RATE

.....THEN FOR THE VARIOUS ROTATION PATTERNS ABOVE.....AND A BALANCED SYSTEM

SOLVE FOR: FIRST-TERM SHORE BILLETS AND FIRST-TERM SEA BILLETS

FIG. C-1 (Continued)

SEA DUTY TOUR	SHORE DUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS		125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
12.	8.	120407.	180385.	210663.	90129.	35550.	144835.	65828.	54579.	0.8600	0.0935
12.	9.	120407.	180385.	206838.	93954.	35550.	144835.	62003.	58404.	0.8600	0.0935
12.	10.	120407.	180385.	203376.	97416.	35550.	144835.	58541.	61866.	0.8600	0.0935
12.	11.	120407.	180385.	200229.	100563.	35550.	144835.	55394.	65013.	0.8600	0.0935
12.	12.	120407.	180385.	197358.	103434.	35550.	144835.	52523.	67884.	0.8600	0.0935
13.	8.	120407.	180385.	212697.	88095.	35550.	144835.	67862.	52545.	0.8600	0.0935
13.	9.	120407.	180385.	208892.	91900.	35550.	144835.	64057.	56350.	0.8600	0.0935
13.	10.	120407.	180385.	205434.	95358.	35550.	144835.	60599.	59808.	0.8600	0.0935
13.	11.	120407.	180385.	202279.	98513.	35550.	144835.	57444.	62963.	0.8600	0.0935
13.	12.	120407.	180385.	199392.	101400.	35550.	144835.	54557.	65850.	0.8600	0.0935
14.	8.	120407.	180385.	214537.	88255.	35550.	144835.	69702.	52705.	0.8600	0.0935
14.	9.	120407.	180385.	210758.	92034.	35550.	144835.	65923.	54484.	0.8600	0.0935
14.	10.	120407.	180385.	207311.	93481.	35550.	144835.	62476.	57931.	0.8600	0.0935
14.	11.	120407.	180385.	204156.	96636.	35550.	144835.	59321.	61086.	0.8600	0.0935
14.	12.	120407.	180385.	201259.	99533.	35550.	144835.	56424.	63983.	0.8600	0.0935
15.	8.	120407.	180385.	216210.	84582.	35550.	144835.	71375.	49032.	0.8600	0.0935
15.	9.	120407.	180385.	212461.	88331.	35550.	144835.	67626.	52781.	0.8600	0.0935
15.	10.	120407.	180385.	209030.	91762.	35550.	144835.	64195.	56212.	0.8600	0.0935
15.	11.	120407.	180385.	205876.	94913.	35550.	144835.	61044.	59363.	0.8600	0.0935
15.	12.	120407.	180385.	202978.	97814.	35550.	144835.	58143.	62264.	0.8600	0.0935
16.	8.	120407.	180385.	217736.	83056.	35550.	144835.	72901.	47506.	0.8600	0.0935
16.	9.	120407.	180385.	214020.	86772.	35550.	144835.	69185.	51222.	0.8600	0.0935
16.	10.	120407.	180385.	210638.	90184.	35550.	144835.	65773.	54634.	0.8600	0.0935
16.	11.	120407.	180385.	207487.	93325.	35550.	144835.	62632.	57775.	0.8600	0.0935
16.	12.	120407.	180385.	204565.	96227.	35550.	144835.	59730.	60677.	0.8600	0.0935
17.	8.	120407.	180385.	219132.	81660.	35550.	144835.	74297.	46110.	0.8600	0.0935
17.	9.	120407.	180385.	215452.	85340.	35550.	144835.	70617.	49790.	0.8600	0.0935
17.	10.	120407.	180385.	212062.	88730.	35550.	144835.	67227.	53180.	0.8600	0.0935
17.	11.	120407.	180385.	208932.	91860.	35550.	144835.	64097.	56310.	0.8600	0.0935
17.	12.	120407.	180385.	206035.	94757.	35550.	144835.	61200.	59207.	0.8600	0.0935
18.	8.	120407.	180385.	220415.	80377.	35550.	144835.	75580.	44827.	0.8600	0.0935
18.	9.	120407.	180385.	216770.	84022.	35550.	144835.	71935.	48472.	0.8600	0.0935
18.	10.	120407.	180385.	213404.	87388.	35550.	144835.	68569.	51838.	0.8600	0.0935
18.	11.	120407.	180385.	210289.	90503.	35550.	144835.	65454.	54953.	0.8600	0.0935
18.	12.	120407.	180385.	207398.	93394.	35550.	144835.	62563.	57844.	0.8600	0.0935
19.	8.	120407.	180385.	221596.	78196.	35550.	144835.	76761.	42646.	0.8600	0.0935
19.	9.	120407.	180385.	217987.	82805.	35550.	144835.	73152.	47255.	0.8600	0.0935
19.	10.	120407.	180385.	214646.	86146.	35550.	144835.	69811.	50596.	0.8600	0.0935
19.	11.	120407.	180385.	211547.	89245.	35550.	144835.	66712.	53695.	0.8600	0.0935
19.	12.	120407.	180385.	208666.	92126.	35550.	144835.	63831.	56576.	0.8600	0.0935
20.	8.	120407.	180385.	222687.	78105.	35550.	144835.	77852.	42555.	0.8600	0.0935
20.	9.	120407.	180385.	219114.	81678.	35550.	144835.	74279.	46128.	0.8600	0.0935
20.	10.	120407.	180385.	215799.	84993.	35550.	144835.	70964.	49443.	0.8600	0.0935
20.	11.	120407.	180385.	212717.	88075.	35550.	144835.	67882.	52525.	0.8600	0.0935
20.	12.	120407.	180385.	209846.	90946.	35550.	144835.	65011.	55396.	0.8600	0.0935

GIVEN: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE

.....THEN FOR THE VARIOUS ROTATION PATTERNS ABOVE.....AND A BALANCED SYSTEM

SOLVE FOR: CAREER SEA BILLETS AND CAREER SHORE BILLETS

FIG. C-1 (Continued)

SEA DUTY TOUR	SHORE DUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS		125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
12.	8.	124774.	186927.	219447.	92254.	35550.	151377.	68070.	56704.	0.8600	0.0935
12.	9.	126784.	189938.	219447.	97275.	35550.	154388.	65059.	61725.	0.8600	0.0935
12.	10.	128664.	192754.	219447.	101571.	35550.	157204.	62243.	66421.	0.8600	0.0935
12.	11.	130424.	195353.	219447.	106376.	35550.	159843.	59604.	70820.	0.8600	0.0935
12.	12.	132077.	197867.	219447.	110497.	35550.	162317.	57130.	74947.	0.8600	0.0935
13.	8.	123737.	185373.	219447.	85863.	35550.	149822.	69624.	54113.	0.8600	0.0935
13.	9.	125703.	188318.	219447.	94574.	35550.	152768.	66679.	59024.	0.8600	0.0935
13.	10.	127546.	191084.	219447.	99185.	35550.	155534.	63913.	63635.	0.8600	0.0935
13.	11.	129283.	193684.	219447.	103520.	35550.	158134.	61313.	67970.	0.8600	0.0935
13.	12.	130918.	196131.	219447.	107602.	35550.	160581.	58866.	72052.	0.8600	0.0935
14.	8.	122812.	183988.	219447.	87353.	35550.	148438.	71009.	51803.	0.8600	0.0935
14.	9.	124735.	186868.	219447.	92156.	35550.	151318.	68129.	56606.	0.8600	0.0935
14.	10.	126546.	189583.	219447.	96682.	35550.	154033.	65414.	61132.	0.8600	0.0935
14.	11.	128256.	192143.	219447.	100952.	35550.	156593.	62854.	65402.	0.8600	0.0935
14.	12.	129870.	194561.	219447.	104984.	35550.	159011.	60436.	69434.	0.8600	0.0935
15.	8.	121983.	182745.	219447.	85281.	35550.	147195.	72252.	49731.	0.8600	0.0935
15.	9.	123884.	185564.	219447.	89981.	35550.	150014.	69433.	54431.	0.8600	0.0935
15.	10.	125642.	188228.	219447.	94423.	35550.	152678.	66769.	58873.	0.8600	0.0935
15.	11.	127325.	190748.	219447.	98626.	35550.	155198.	64249.	63076.	0.8600	0.0935
15.	12.	128918.	193135.	219447.	102606.	35550.	157585.	61862.	67056.	0.8600	0.0935
16.	8.	121235.	181626.	219447.	83414.	35550.	146076.	73371.	47864.	0.8600	0.0935
16.	9.	123077.	184384.	219447.	88014.	35550.	148834.	70613.	52464.	0.8600	0.0935
16.	10.	124822.	186959.	219447.	92374.	35550.	151449.	67998.	56824.	0.8600	0.0935
16.	11.	126478.	189480.	219447.	96511.	35550.	153733.	65517.	60961.	0.8600	0.0935
16.	12.	128050.	191836.	219447.	100439.	35550.	156286.	63161.	64889.	0.8600	0.0935
17.	8.	120558.	180612.	219447.	81723.	35550.	145062.	74385.	46173.	0.8600	0.0935
17.	9.	122362.	183313.	219447.	86228.	35550.	147763.	71684.	50678.	0.8600	0.0935
17.	10.	124076.	185881.	219447.	90510.	35550.	150331.	69116.	54960.	0.8600	0.0935
17.	11.	125706.	188323.	219447.	94582.	35550.	152773.	66674.	59032.	0.8600	0.0935
17.	12.	127256.	190647.	219447.	98456.	35550.	155097.	64350.	62906.	0.8600	0.0935
18.	8.	119944.	179650.	219447.	80187.	35550.	144140.	75307.	44637.	0.8600	0.0935
18.	9.	121710.	182338.	219447.	84691.	35550.	146788.	72659.	49051.	0.8600	0.0935
18.	10.	123394.	184859.	219447.	88906.	35550.	149309.	70138.	53256.	0.8600	0.0935
18.	11.	124998.	187263.	219447.	92814.	35550.	151713.	67734.	57264.	0.8600	0.0935
18.	12.	126526.	189556.	219447.	96637.	35550.	154006.	65441.	61087.	0.8600	0.0935
19.	8.	119382.	178849.	219447.	78784.	35550.	143299.	76148.	43234.	0.8600	0.0935
19.	9.	121115.	181445.	219447.	83113.	35550.	145895.	73552.	47563.	0.8600	0.0935
19.	10.	122769.	183923.	219447.	87245.	35550.	148373.	71074.	51695.	0.8600	0.0935
19.	11.	124348.	186290.	219447.	91191.	35550.	150740.	68707.	55641.	0.8600	0.0935
19.	12.	125859.	188551.	219447.	94963.	35550.	153001.	66446.	59413.	0.8600	0.0935
20.	8.	118868.	178080.	219447.	77501.	35550.	142530.	76917.	41951.	0.8600	0.0935
20.	9.	120568.	180626.	219447.	81747.	35550.	145076.	74371.	46197.	0.8600	0.0935
20.	10.	122194.	183062.	219447.	85809.	35550.	147512.	71935.	50259.	0.8600	0.0935
20.	11.	123750.	185393.	219447.	89696.	35550.	149843.	69604.	54146.	0.8600	0.0935
20.	12.	125235.	187625.	219447.	92417.	35550.	152075.	67372.	57867.	0.8600	0.0935

GIVEN: FIRST-TERM SHORE BILLETS, TOTAL SEA BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE

.....THEN FOR THE VARIOUS ROTATION PATTERNS ABOVE.....AND A BALANCED SYSTEM

SOLVE FOR: FIRST-TERM SEA BILLETS, CAREER SEA BILLETS AND CAREER SHORE BILLETS

FIG. C-1 (Continued)

SEA DUTY TOUR	SHORE DUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS		125770.	180385.	219447.	66708.	35550.	144835.	74612.	51158.	0.8600	0.0935
12.	8.	109097.	163442.	219447.	53092.	0.	163442.	56095.	53092.	0.8600	0.0935
12.	9.	110979.	166261.	219447.	57793.	0.	166261.	53186.	57793.	0.8600	0.0935
12.	10.	112739.	168898.	219447.	62190.	0.	168898.	50549.	62190.	0.8600	0.0935
12.	11.	114388.	171368.	219447.	66309.	0.	171368.	48079.	66309.	0.8600	0.0935
12.	12.	115935.	173685.	219447.	70173.	0.	173685.	45762.	70173.	0.8600	0.0935
13.	8.	108245.	162163.	219447.	50961.	0.	162163.	57284.	50961.	0.8600	0.0935
13.	9.	110095.	164937.	219447.	55585.	0.	164937.	54510.	55585.	0.8600	0.0935
13.	10.	111834.	167541.	219447.	59928.	0.	167541.	51906.	59928.	0.8600	0.0935
13.	11.	113468.	169990.	219447.	64011.	0.	169990.	49457.	64011.	0.8600	0.0935
13.	12.	115006.	172295.	219447.	67854.	0.	172295.	47152.	67854.	0.8600	0.0935
14.	8.	107483.	161024.	219447.	49060.	0.	161024.	58423.	49060.	0.8600	0.0935
14.	9.	109304.	163752.	219447.	53609.	0.	163752.	55695.	53609.	0.8600	0.0935
14.	10.	111020.	166322.	219447.	57895.	0.	166322.	53125.	57895.	0.8600	0.0935
14.	11.	112639.	168747.	219447.	61939.	0.	168747.	50700.	61939.	0.8600	0.0935
14.	12.	114167.	171037.	219447.	65757.	0.	171037.	48410.	65757.	0.8600	0.0935
15.	8.	106801.	160001.	219447.	47355.	0.	160001.	59446.	47355.	0.8600	0.0935
15.	9.	108592.	162685.	219447.	51830.	0.	162685.	56762.	51830.	0.8600	0.0935
15.	10.	110285.	165222.	219447.	56060.	0.	165222.	54225.	56060.	0.8600	0.0935
15.	11.	111886.	167622.	219447.	60063.	0.	167622.	51825.	60063.	0.8600	0.0935
15.	12.	113405.	169895.	219447.	63853.	0.	169895.	49552.	63853.	0.8600	0.0935
16.	8.	106186.	159080.	219447.	45819.	0.	159080.	60367.	45819.	0.8600	0.0935
16.	9.	107949.	161721.	219447.	50223.	0.	161721.	57726.	50223.	0.8600	0.0935
16.	10.	109626.	164224.	219447.	54397.	0.	164224.	55223.	54397.	0.8600	0.0935
16.	11.	111205.	166599.	219447.	58357.	0.	166599.	52848.	58357.	0.8600	0.0935
16.	12.	112710.	168854.	219447.	62117.	0.	168854.	50593.	62117.	0.8600	0.0935
17.	8.	105629.	158246.	219447.	44428.	0.	158246.	61201.	44428.	0.8600	0.0935
17.	9.	107365.	160845.	219447.	48763.	0.	160845.	58602.	48763.	0.8600	0.0935
17.	10.	109013.	163316.	219447.	52882.	0.	163316.	56131.	52882.	0.8600	0.0935
17.	11.	110581.	165666.	219447.	56800.	0.	165666.	53781.	56800.	0.8600	0.0935
17.	12.	112074.	167902.	219447.	60529.	0.	167902.	51545.	60529.	0.8600	0.0935
18.	8.	105123.	157408.	219447.	43164.	0.	157408.	61959.	43164.	0.8600	0.0935
18.	9.	106831.	160048.	219447.	47432.	0.	160048.	59399.	47432.	0.8600	0.0935
18.	10.	108460.	162486.	219447.	51499.	0.	162486.	56961.	51499.	0.8600	0.0935
18.	11.	110011.	164811.	219447.	55375.	0.	164811.	54636.	55375.	0.8600	0.0935
18.	12.	111490.	167028.	219447.	59071.	0.	167028.	52419.	59071.	0.8600	0.0935
19.	8.	104661.	156796.	219447.	42010.	0.	156796.	62651.	42010.	0.8600	0.0935
19.	9.	106345.	159318.	219447.	46216.	0.	159318.	60129.	46216.	0.8600	0.0935
19.	10.	107952.	161726.	219447.	50231.	0.	161726.	57721.	50231.	0.8600	0.0935
19.	11.	109487.	164026.	219447.	54066.	0.	164026.	55421.	54066.	0.8600	0.0935
19.	12.	110954.	166223.	219447.	57730.	0.	166223.	53224.	57730.	0.8600	0.0935
20.	8.	104239.	156162.	219447.	40954.	0.	156162.	63285.	40954.	0.8600	0.0935
20.	9.	105896.	158648.	219447.	45099.	0.	158648.	60799.	45099.	0.8600	0.0935
20.	10.	107485.	161027.	219447.	49065.	0.	161027.	58420.	49065.	0.8600	0.0935
20.	11.	109005.	163302.	219447.	52860.	0.	163302.	56145.	52860.	0.8600	0.0935
20.	12.	110458.	165481.	219447.	56492.	0.	165481.	53966.	56492.	0.8600	0.0935

GIVEN: FIRST TERM SHORE BILLETS EQUAL TO ZERO, TOTAL SEA BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE

.....THEN FOR THE VARIOUS ROTATION PATTERNS ABOVE.....AND A BALANCED SYSTEM

SOLVE FOR: FIRST-TERM SEA BILLETS, CAREER SEA BILLETS AND CAREER SHORE BILLETS

FIG. C-1 (Continued)

SEA DUTY TOUR	SHORE DUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS		125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
12.	8.	122553.	183602.	219447.	88708.	33516.	153086.	66361.	56192.	0.8600	0.0935
12.	9.	122554.	183601.	219447.	88708.	26035.	157566.	61881.	60673.	0.8600	0.0935
12.	10.	122554.	183601.	219447.	88708.	21910.	161691.	57756.	64798.	0.8600	0.0935
12.	11.	122554.	183601.	219447.	88708.	18102.	165499.	53948.	68606.	0.8600	0.0935
12.	12.	122554.	183601.	219447.	88708.	14577.	169024.	50423.	72131.	0.8600	0.0935
13.	8.	122554.	183601.	219447.	88708.	32036.	150765.	68682.	53872.	0.8600	0.0935
13.	9.	122554.	183601.	219447.	88708.	28378.	155223.	64224.	58330.	0.8600	0.0935
13.	10.	122554.	183601.	219447.	88708.	24251.	159350.	60097.	62457.	0.8600	0.0935
13.	11.	122553.	183602.	219447.	88708.	20423.	163179.	56268.	66285.	0.8600	0.0935
13.	12.	122553.	183602.	219447.	88708.	16363.	166739.	52708.	69845.	0.8600	0.0935
14.	8.	122553.	183602.	219447.	88708.	34952.	148650.	70797.	51756.	0.8600	0.0935
14.	9.	122553.	183602.	219447.	88708.	30526.	153076.	66371.	56182.	0.8600	0.0935
14.	10.	122554.	183601.	219447.	88708.	26408.	157193.	62254.	60300.	0.8600	0.0935
14.	11.	122553.	183602.	219447.	88708.	22571.	161031.	58416.	64137.	0.8600	0.0935
14.	12.	122554.	183601.	219447.	88708.	18937.	164614.	54833.	67721.	0.8600	0.0935
15.	8.	122553.	183602.	219447.	88708.	36888.	146714.	72733.	49820.	0.8600	0.0935
15.	9.	122553.	183602.	219447.	88708.	32501.	151101.	68346.	54207.	0.8600	0.0935
15.	10.	122553.	183602.	219447.	88708.	28401.	155201.	64246.	58307.	0.8600	0.0935
15.	11.	122554.	183601.	219447.	88708.	24563.	159038.	60409.	62145.	0.8600	0.0935
15.	12.	122554.	183601.	219447.	88708.	20966.	162635.	56812.	65742.	0.8600	0.0935
16.	8.	122554.	183601.	219447.	88708.	38665.	144936.	74511.	49043.	0.8600	0.0935
16.	9.	122553.	183602.	219447.	88708.	34322.	149280.	70167.	52386.	0.8600	0.0935
16.	10.	122554.	183601.	219447.	88708.	30246.	153355.	66092.	56462.	0.8600	0.0935
16.	11.	122554.	183601.	219447.	88708.	26416.	157185.	62262.	60292.	0.8600	0.0935
16.	12.	122554.	183601.	219447.	88708.	22812.	160789.	58658.	63896.	0.8600	0.0935
17.	8.	122554.	183601.	219447.	88708.	40391.	143300.	76147.	46407.	0.8600	0.0935
17.	9.	122554.	183601.	219447.	88708.	36005.	147596.	71851.	50703.	0.8600	0.0935
17.	10.	122554.	183601.	219447.	88708.	31958.	151643.	67804.	54750.	0.8600	0.0935
17.	11.	122554.	183601.	219447.	88708.	28141.	155460.	63987.	58567.	0.8600	0.0935
17.	12.	122554.	183601.	219447.	88708.	24538.	159063.	60384.	62170.	0.8600	0.0935
18.	8.	122554.	183601.	219447.	88708.	41812.	141789.	77658.	44896.	0.8600	0.0935
18.	9.	122554.	183601.	219447.	88708.	37565.	146036.	73411.	49143.	0.8600	0.0935
18.	10.	122553.	183602.	219447.	88708.	33551.	150051.	69396.	53157.	0.8600	0.0935
18.	11.	122554.	183601.	219447.	88708.	29752.	153849.	65598.	56956.	0.8600	0.0935
18.	12.	122554.	183601.	219447.	88708.	26154.	157447.	62000.	60554.	0.8600	0.0935
19.	8.	122554.	183601.	219447.	88708.	43210.	140391.	79056.	43498.	0.8600	0.0935
19.	9.	122554.	183601.	219447.	88708.	39014.	144587.	74860.	47694.	0.8600	0.0935
19.	10.	122553.	183602.	219447.	88708.	35035.	148567.	70880.	51673.	0.8600	0.0935
19.	11.	122554.	183601.	219447.	88708.	31257.	152344.	67103.	55451.	0.8600	0.0935
19.	12.	122554.	183601.	219447.	88708.	27668.	155933.	63514.	59040.	0.8600	0.0935
20.	8.	122554.	183601.	219447.	88708.	44506.	139195.	80352.	42202.	0.8600	0.0935
20.	9.	122553.	183602.	219447.	88708.	40363.	143239.	76208.	46345.	0.8600	0.0935
20.	10.	122554.	183601.	219447.	88708.	36420.	147181.	72266.	50288.	0.8600	0.0935
20.	11.	122554.	183601.	219447.	88708.	32666.	150935.	68512.	54042.	0.8600	0.0935
20.	12.	122553.	183602.	219447.	88708.	29091.	154511.	64936.	57617.	0.8600	0.0935

GIVEN: TOTAL SEA BILLETS, TOTAL SHORE BILLETS, CAREER CONTINUATION RATE AND FIRST TERM RETENTION RATE

.....THEN FOR THE VARIOUS ROTATION PATTERNS ABOVE.....AND A BALANCED SYSTEM

SOLVE FOR: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS, CAREER SHORE BILLETS AND CAREER SEA BILLETS

FIG. C-1 (Continued)

SEA DUTY TOUR	SHORE DUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS		125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
12.	8.	120407.	180385.	141718.	155074.	113279.	67106.	74612.	45795.	0.8600	0.0935
12.	9.	120407.	180385.	115176.	185618.	139821.	40564.	74612.	45795.	0.8600	0.0935
12.	10.	120407.	180385.	93982.	206810.	161015.	19370.	74612.	45795.	0.8600	0.0935
12.	11.	120407.	180385.	76678.	224114.	178315.	2066.	74612.	45795.	0.8600	0.0935
12.	12.	120407.	180385.	62292.	238501.	192706.	-12321.	74612.	45795.	0.8600	0.0935
13.	8.	120407.	180385.	161502.	139290.	93495.	86890.	74612.	45795.	0.8600	0.0935
13.	9.	120407.	180385.	134959.	165833.	120038.	60347.	74612.	45795.	0.8600	0.0935
13.	10.	120407.	180385.	113765.	187027.	141232.	39153.	74612.	45795.	0.8600	0.0935
13.	11.	120407.	180385.	96461.	204331.	158536.	21849.	74612.	45795.	0.8600	0.0935
13.	12.	120407.	180385.	82074.	218718.	172923.	7462.	74612.	45795.	0.8600	0.0935
14.	8.	120407.	180385.	178412.	122380.	76595.	103800.	74612.	45795.	0.8600	0.0935
14.	9.	120407.	180385.	151870.	148922.	103127.	77258.	74612.	45795.	0.8600	0.0935
14.	10.	120407.	180385.	130676.	170116.	124321.	56064.	74612.	45795.	0.8600	0.0935
14.	11.	120407.	180385.	113372.	187420.	141625.	38760.	74612.	45795.	0.8600	0.0935
14.	12.	120407.	180385.	98985.	201807.	156012.	24373.	74612.	45795.	0.8600	0.0935
15.	8.	120407.	180385.	193025.	107787.	61972.	118413.	74612.	45795.	0.8600	0.0935
15.	9.	120407.	180385.	166482.	134310.	88515.	91870.	74612.	45795.	0.8600	0.0935
15.	10.	120407.	180385.	145288.	155504.	109709.	70676.	74612.	45795.	0.8600	0.0935
15.	11.	120407.	180385.	127984.	172808.	127013.	53372.	74612.	45795.	0.8600	0.0935
15.	12.	120407.	180385.	113598.	187196.	141399.	38986.	74612.	45795.	0.8600	0.0935
16.	8.	120407.	180385.	285771.	95021.	49226.	131159.	74612.	45795.	0.8600	0.0935
16.	9.	120407.	180385.	179228.	121564.	75769.	104616.	74612.	45795.	0.8600	0.0935
16.	10.	120407.	180385.	150034.	142758.	96963.	83422.	74612.	45795.	0.8600	0.0935
16.	11.	120407.	180385.	140730.	160062.	114267.	66118.	74612.	45795.	0.8600	0.0935
16.	12.	120407.	180385.	126344.	174448.	128653.	51732.	74612.	45795.	0.8600	0.0935
17.	8.	120407.	180385.	216975.	83613.	38016.	142367.	74612.	45795.	0.8600	0.0935
17.	9.	120407.	180385.	190437.	110355.	64596.	115825.	74612.	45795.	0.8600	0.0935
17.	10.	120407.	180385.	169243.	131549.	85754.	94631.	74612.	45795.	0.8600	0.0935
17.	11.	120407.	180385.	151939.	148853.	103058.	77327.	74612.	45795.	0.8600	0.0935
17.	12.	120407.	180385.	137552.	163240.	117445.	62940.	74612.	45795.	0.8600	0.0935
18.	8.	120407.	180385.	226907.	73685.	28090.	152295.	74612.	45795.	0.8600	0.0935
18.	9.	120407.	180385.	200364.	100428.	54633.	125752.	74612.	45795.	0.8600	0.0935
18.	10.	120407.	180385.	179170.	121622.	75827.	104558.	74612.	45795.	0.8600	0.0935
18.	11.	120407.	180385.	161866.	138926.	93131.	87254.	74612.	45795.	0.8600	0.0935
18.	12.	120407.	180385.	147480.	153312.	107517.	72868.	74612.	45795.	0.8600	0.0935
19.	8.	120407.	180385.	235756.	64036.	19241.	161144.	74612.	45795.	0.8600	0.0935
19.	9.	120407.	180385.	209213.	91579.	45784.	134601.	74612.	45795.	0.8600	0.0935
19.	10.	120407.	180385.	188019.	112773.	66978.	113407.	74612.	45795.	0.8600	0.0935
19.	11.	120407.	180385.	170715.	130077.	84282.	96103.	74612.	45795.	0.8600	0.0935
19.	12.	120407.	180385.	156329.	144463.	98668.	81717.	74612.	45795.	0.8600	0.0935
20.	8.	120407.	180385.	243688.	57104.	11305.	169076.	74612.	45795.	0.8600	0.0935
20.	9.	120407.	180385.	217146.	83646.	37851.	142534.	74612.	45795.	0.8600	0.0935
20.	10.	120407.	180385.	195952.	104840.	59045.	121340.	74612.	45795.	0.8600	0.0935
20.	11.	120407.	180385.	178648.	122144.	76349.	104036.	74612.	45795.	0.8600	0.0935
20.	12.	120407.	180385.	164261.	136531.	90736.	89649.	74612.	45795.	0.8600	0.0935

GIVEN: CAREER SEA BILLETS, TOTAL FIRST-TERM BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE

.....THEN FOR THE VARIOUS ROTATION PATTERNS ABOVE.....AND A BALANCED SYSTEM

SOLVE FOR: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS AND CAREER SHORE BILLETS

FIG. C-1 (Continued)

SEA CUTY TOUR	SHORE CUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS		125770.	180365.	219447.	85708.	35550.	144835.	74612.	51158.	0.8600	0.0935
12.	8.	136473.	180365.	219447.	97411.	35550.	144835.	74612.	61861.	0.8600	0.1059
12.	9.	144893.	180365.	219447.	105831.	35550.	144835.	74612.	70281.	0.8600	0.1125
12.	10.	153463.	180365.	219447.	114401.	35550.	144835.	74612.	78851.	0.8600	0.1191
12.	11.	162180.	180365.	219447.	123118.	35550.	144835.	74612.	87568.	0.8600	0.1259
12.	12.	171144.	180365.	219447.	131982.	35550.	144835.	74612.	96432.	0.8600	0.1328
13.	8.	132384.	180365.	219447.	93322.	35550.	144835.	74612.	57772.	0.8600	0.1027
13.	9.	140247.	180365.	219447.	101185.	35550.	144835.	74612.	65635.	0.8600	0.1088
13.	10.	148250.	180365.	219447.	109188.	35550.	144835.	74612.	73638.	0.8600	0.1151
13.	11.	156392.	180365.	219447.	117330.	35550.	144835.	74612.	81780.	0.8600	0.1214
13.	12.	164676.	180365.	219447.	125608.	35550.	144835.	74612.	90058.	0.8600	0.1278
14.	8.	128829.	180365.	219447.	89027.	35550.	144835.	74612.	54277.	0.8600	0.1000
14.	9.	136276.	180365.	219447.	97214.	35550.	144835.	74612.	61664.	0.8600	0.1058
14.	10.	143795.	180365.	219447.	104733.	35550.	144835.	74612.	69183.	0.8600	0.1116
14.	11.	151444.	180365.	219447.	112382.	35550.	144835.	74612.	76832.	0.8600	0.1175
14.	12.	159221.	180365.	219447.	120159.	35550.	144835.	74612.	84609.	0.8600	0.1236
15.	8.	125068.	180365.	219447.	86006.	35550.	144835.	74612.	51256.	0.8600	0.0977
15.	9.	132845.	180365.	219447.	93783.	35550.	144835.	74612.	58233.	0.8600	0.1031
15.	10.	139945.	180365.	219447.	100883.	35550.	144835.	74612.	65333.	0.8600	0.1086
15.	11.	147168.	180365.	219447.	108106.	35550.	144835.	74612.	72556.	0.8600	0.1142
15.	12.	154513.	180365.	219447.	115451.	35550.	144835.	74612.	79901.	0.8600	0.1199
16.	8.	123234.	180365.	219447.	84172.	35550.	144835.	74612.	48622.	0.8600	0.0956
16.	9.	129852.	180365.	219447.	90790.	35550.	144835.	74612.	55240.	0.8600	0.1008
16.	10.	136597.	180365.	219447.	97525.	35550.	144835.	74612.	61975.	0.8600	0.1060
16.	11.	143439.	180365.	219447.	104377.	35550.	144835.	74612.	68827.	0.8600	0.1113
16.	12.	150406.	180365.	219447.	111344.	35550.	144835.	74612.	75794.	0.8600	0.1167
17.	8.	120917.	180365.	219447.	81855.	35550.	144835.	74612.	46305.	0.8600	0.0938
17.	9.	127226.	180365.	219447.	88158.	35550.	144835.	74612.	52608.	0.8600	0.0987
17.	10.	133634.	180365.	219447.	94572.	35550.	144835.	74612.	59022.	0.8600	0.1037
17.	11.	140159.	180365.	219447.	101097.	35550.	144835.	74612.	65547.	0.8600	0.1088
17.	12.	146794.	180365.	219447.	107732.	35550.	144835.	74612.	72182.	0.8600	0.1139
18.	8.	118865.	180365.	219447.	79803.	35550.	144835.	74612.	44253.	0.8600	0.0923
18.	9.	124888.	180365.	219447.	85826.	35550.	144835.	74612.	50276.	0.8600	0.0969
18.	10.	131018.	180365.	219447.	91956.	35550.	144835.	74612.	56406.	0.8600	0.1017
18.	11.	137255.	180365.	219447.	98193.	35550.	144835.	74612.	62643.	0.8600	0.1065
18.	12.	143596.	180365.	219447.	104534.	35550.	144835.	74612.	68984.	0.8600	0.1114
19.	8.	117036.	180365.	219447.	77974.	35550.	144835.	74612.	42424.	0.8600	0.0908
19.	9.	122816.	180365.	219447.	83748.	35550.	144835.	74612.	48198.	0.8600	0.0953
19.	10.	128687.	180365.	219447.	89625.	35550.	144835.	74612.	54075.	0.8600	0.0999
19.	11.	134666.	180365.	219447.	95604.	35550.	144835.	74612.	60054.	0.8600	0.1045
19.	12.	140744.	180365.	219447.	101682.	35550.	144835.	74612.	66132.	0.8600	0.1092
20.	8.	115396.	180365.	219447.	76334.	35550.	144835.	74612.	40784.	0.8600	0.0896
20.	9.	120947.	180365.	219447.	81885.	35550.	144835.	74612.	46335.	0.8600	0.0939
20.	10.	126597.	180365.	219447.	87535.	35550.	144835.	74612.	51985.	0.8600	0.0983
20.	11.	132345.	180365.	219447.	93283.	35550.	144835.	74612.	57733.	0.8600	0.1027
20.	12.	138188.	180365.	219447.	99126.	35550.	144835.	74612.	63576.	0.8600	0.1073

GIVEN: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS, CAREER SEA BILLETS AND CAREER CONTINUATION RATE

.....THEN FOR THE VARIOUS ROTATION PATTERNS ABOVE.....AND A BALANCED SYSTEM

SOLVE FOR: CAREER SHORE BILLETS AND FIRST-TERM RETENTION RATE

FIG. C-1 (Continued)

SEA DUTY TOUR	SHORE DUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS		125770.	180385.	219447.	66938.	35553.	144835.	74612.	51158.	0.8600	0.0935
12.	8.	135004.	180385.	219447.	95542.	35550.	144835.	74612.	60392.	0.8751	0.0935
12.	9.	142427.	180385.	219447.	102365.	35550.	144835.	74612.	67815.	0.8817	0.0935
12.	10.	149832.	180385.	219447.	110770.	35550.	144835.	74612.	75220.	0.8875	0.0935
12.	11.	157230.	180385.	219447.	118168.	35550.	144835.	74612.	82618.	0.8928	0.0935
12.	12.	164617.	180385.	219447.	125555.	35550.	144835.	74612.	90005.	0.8976	0.0935
13.	8.	131273.	180385.	219447.	92211.	35550.	144835.	74612.	56661.	0.8716	0.0935
13.	9.	138219.	180385.	219447.	99157.	35550.	144835.	74612.	63607.	0.8780	0.0935
13.	10.	145152.	180385.	219447.	106090.	35550.	144835.	74612.	70540.	0.8839	0.0935
13.	11.	152070.	180385.	219447.	113008.	35550.	144835.	74612.	77458.	0.8891	0.0935
13.	12.	158980.	180385.	219447.	119918.	35550.	144835.	74612.	84368.	0.8940	0.0935
14.	8.	128085.	180385.	219447.	89027.	35550.	144835.	74612.	53477.	0.8684	0.0935
14.	9.	134630.	180385.	219447.	95560.	35550.	144835.	74612.	60018.	0.8748	0.0935
14.	10.	141155.	180385.	219447.	102093.	35550.	144835.	74612.	66543.	0.8805	0.0935
14.	11.	147667.	180385.	219447.	108605.	35550.	144835.	74612.	73055.	0.8859	0.0935
14.	12.	154166.	180385.	219447.	115104.	35550.	144835.	74612.	79554.	0.8907	0.0935
15.	8.	125346.	180385.	219447.	86284.	35550.	144835.	74612.	50734.	0.8655	0.0935
15.	9.	131935.	180385.	219447.	92873.	35550.	144835.	74612.	56923.	0.8718	0.0935
15.	10.	137710.	180385.	219447.	98648.	35550.	144835.	74612.	63698.	0.8776	0.0935
15.	11.	143866.	180385.	219447.	104804.	35550.	144835.	74612.	69854.	0.8828	0.0935
15.	12.	150013.	180385.	219447.	110951.	35550.	144835.	74612.	75401.	0.8876	0.0935
16.	8.	122556.	180385.	219447.	83267.	35550.	144835.	74612.	48347.	0.8629	0.0935
16.	9.	129845.	180385.	219447.	89783.	35550.	144835.	74612.	54233.	0.8692	0.0935
16.	10.	134710.	180385.	219447.	95648.	35550.	144835.	74612.	60098.	0.8749	0.0935
16.	11.	140959.	180385.	219447.	101497.	35550.	144835.	74612.	65947.	0.8801	0.0935
16.	12.	146395.	180385.	219447.	107333.	35550.	144835.	74612.	71783.	0.8848	0.0935
17.	8.	120867.	180385.	219447.	81803.	35550.	144835.	74612.	46255.	0.8605	0.0935
17.	9.	126484.	180385.	219447.	87422.	35550.	144835.	74612.	51872.	0.8667	0.0935
17.	10.	132079.	180385.	219447.	93017.	35550.	144835.	74612.	57467.	0.8724	0.0935
17.	11.	137658.	180385.	219447.	98596.	35550.	144835.	74612.	63046.	0.8775	0.0935
17.	12.	143223.	180385.	219447.	104161.	35550.	144835.	74612.	68611.	0.8823	0.0935
18.	8.	119018.	180385.	219447.	79956.	35550.	144835.	74612.	44406.	0.8584	0.0935
18.	9.	124396.	180385.	219447.	85334.	35550.	144835.	74612.	49784.	0.8645	0.0935
18.	10.	129753.	180385.	219447.	90691.	35550.	144835.	74612.	55141.	0.8701	0.0935
18.	11.	135095.	180385.	219447.	96033.	35550.	144835.	74612.	60483.	0.8752	0.0935
18.	12.	140415.	180385.	219447.	101353.	35550.	144835.	74612.	65803.	0.8799	0.0935
19.	8.	117377.	180385.	219447.	78315.	35550.	144835.	74612.	42765.	0.8564	0.0935
19.	9.	122543.	180385.	219447.	83481.	35550.	144835.	74612.	47931.	0.8624	0.0935
19.	10.	127687.	180385.	219447.	88625.	35550.	144835.	74612.	53075.	0.8680	0.0935
19.	11.	132813.	180385.	219447.	93751.	35550.	144835.	74612.	58201.	0.8731	0.0935
19.	12.	137919.	180385.	219447.	98857.	35550.	144835.	74612.	63307.	0.8778	0.0935
20.	8.	115911.	180385.	219447.	76849.	35550.	144835.	74612.	41299.	0.8546	0.0935
20.	9.	120887.	180385.	219447.	81825.	35550.	144835.	74612.	46275.	0.8606	0.0935
20.	10.	125861.	180385.	219447.	86779.	35550.	144835.	74612.	51229.	0.8661	0.0935
20.	11.	130774.	180385.	219447.	91712.	35550.	144835.	74612.	56162.	0.8711	0.0935
20.	12.	135689.	180385.	219447.	96627.	35550.	144835.	74612.	61077.	0.8758	0.0935

GIVEN: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS, CAREER SEA BILLETS AND FIRST-TERM RETENTION RATE

.....THEN FOR THE VARIOUS ROTATION PATTERNS ABOVE.....AND A BALANCED SYSTEM

SOLVE FOR: CAREER SHORE BILLETS AND CAREER CONTINUATION RATE

FIG. C-1 (Continued)

SEA DUTY TOUR	SHORE DUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS		125770.	18C3E5.	219447.	8E708.	35550.	144835.	74612.	51158.	0.8600	0.0935
12.	8.	125770.	18C3E5.	219447.	8E708.	35550.	144835.	74612.	51158.	0.9815	0.0129
12.	9.	NO FEASIBLE SOLUTION				35550.	144835.	74612.	51158.	1.0000	0.0000
12.	10.	NO FEASIBLE SOLUTION				35550.	144835.	74612.	51158.	1.0000	0.0000
12.	11.	NO FEASIBLE SOLUTION				35550.	144835.	74612.	51158.	1.0000	0.0000
12.	12.	NO FEASIBLE SOLUTION				35550.	144835.	74612.	51158.	1.0000	0.0000
13.	8.	125770.	18C3E5.	219447.	8E708.	35550.	144835.	74612.	51158.	0.9331	0.0466
13.	9.	NO FEASIBLE SOLUTION				35550.	144835.	74612.	51158.	1.0000	0.0000
13.	10.	NO FEASIBLE SOLUTION				35550.	144835.	74612.	51158.	1.0000	0.0000
13.	11.	NO FEASIBLE SOLUTION				35550.	144835.	74612.	51158.	1.0000	0.0000
13.	12.	NO FEASIBLE SOLUTION				35550.	144835.	74612.	51158.	1.0000	0.0000
14.	8.	125770.	18C3E5.	219447.	8E708.	35550.	144835.	74612.	51158.	0.8936	0.0743
14.	9.	125770.	18C3E5.	219447.	8E708.	35550.	144835.	74612.	51158.	0.9634	0.0256
14.	10.	NO FEASIBLE SOLUTION				35550.	144835.	74612.	51158.	1.0000	0.0000
14.	11.	NO FEASIBLE SOLUTION				35550.	144835.	74612.	51158.	1.0000	0.0000
14.	12.	NO FEASIBLE SOLUTION				35550.	144835.	74612.	51158.	1.0000	0.0000
15.	8.	125770.	18C3E5.	219447.	8E708.	35550.	144835.	74612.	51158.	0.8610	0.0969
15.	9.	125770.	18C3E5.	219447.	8E708.	35550.	144835.	74612.	51158.	0.9280	0.0502
15.	10.	125770.	18C3E5.	219447.	8E708.	35550.	144835.	74612.	51158.	0.9852	0.0103
15.	11.	NO FEASIBLE SOLUTION				35550.	144835.	74612.	51158.	1.0000	0.0000
15.	12.	NO FEASIBLE SOLUTION				35550.	144835.	74612.	51158.	1.0000	0.0000
16.	8.	125770.	18C3E5.	219447.	8E708.	35550.	144835.	74612.	51158.	0.8340	0.1158
16.	9.	125770.	18C3E5.	219447.	8E708.	35550.	144835.	74612.	51158.	0.8984	0.0709
16.	10.	125770.	18C3E5.	219447.	8E708.	35550.	144835.	74612.	51158.	0.9536	0.0324
16.	11.	NO FEASIBLE SOLUTION				35550.	144835.	74612.	51158.	1.0000	0.0000
16.	12.	NO FEASIBLE SOLUTION				35550.	144835.	74612.	51158.	1.0000	0.0000
17.	8.	125770.	18C3E5.	219447.	8E708.	35550.	144835.	74612.	51158.	0.8113	0.1316
17.	9.	125770.	18C3E5.	219447.	8E708.	35550.	144835.	74612.	51158.	0.8733	0.0883
17.	10.	125770.	18C3E5.	219447.	8E708.	35550.	144835.	74612.	51158.	0.9266	0.0512
17.	11.	125770.	18C3E5.	219447.	8E708.	35550.	144835.	74612.	51158.	0.9729	0.0189
17.	12.	NO FEASIBLE SOLUTION				35550.	144835.	74612.	51158.	1.0000	0.0000
18.	8.	125770.	18C3E5.	219447.	8E708.	35550.	144835.	74612.	51158.	0.7922	0.1449
18.	9.	125770.	18C3E5.	219447.	8E708.	35550.	144835.	74612.	51158.	0.8521	0.1031
18.	10.	125770.	18C3E5.	219447.	8E708.	35550.	144835.	74612.	51158.	0.9036	0.0672
18.	11.	125770.	18C3E5.	219447.	8E708.	35550.	144835.	74612.	51158.	0.9484	0.0360
18.	12.	125770.	18C3E5.	219447.	8E708.	35550.	144835.	74612.	51158.	0.9877	0.0088
19.	8.	125770.	18C3E5.	219447.	8E708.	35550.	144835.	74612.	51158.	0.7760	0.1562
19.	9.	125770.	18C3E5.	219447.	8E708.	35550.	144835.	74612.	51158.	0.8339	0.1158
19.	10.	125770.	18C3E5.	219447.	8E708.	35550.	144835.	74612.	51158.	0.8838	0.0811
19.	11.	125770.	18C3E5.	219447.	8E708.	35550.	144835.	74612.	51158.	0.9272	0.0508
19.	12.	125770.	18C3E5.	219447.	8E708.	35550.	144835.	74612.	51158.	0.9654	0.0241
20.	8.	125770.	18C3E5.	219447.	8E708.	35550.	144835.	74612.	51158.	0.7621	0.1658
20.	9.	125770.	18C3E5.	219447.	8E708.	35550.	144835.	74612.	51158.	0.8183	0.1267
20.	10.	125770.	18C3E5.	219447.	8E708.	35550.	144835.	74612.	51158.	0.8666	0.0930
20.	11.	125770.	18C3E5.	219447.	8E708.	35550.	144835.	74612.	51158.	0.9088	0.0636
20.	12.	125770.	18C3E5.	219447.	8E708.	35550.	144835.	74612.	51158.	0.9459	0.0377

GIVEN: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS, CAREER SEA BILLETS AND CAREER SHORE BILLETS

.....THEN FOR THE VARIOUS ROTATION PATTERNS ABOVE.....AND A BALANCED SYSTEM

SOLVE FOR: FIRST-TERM RETENTION RATE AND CAREER CONTINUATION RATE

FIG. C-1 (Continued)

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PROGRAM PARAMETERS##   T1=  144835.##   T2=   35550.##   S1=   74612.##   S2=   51158.##   C=  0.86000##   R=  0.09345
    T1T2=  180385.##   T1S1=  219447.##   T2S2=   86708.##   S1S2=  125770.##   A=    3.000##   B=     2.000
    PERIOD=       4.##   EPS=  0.000010##   SEATIM=       5.##   SHOTIM=       5.##   PERCEN=   0.3000##   TIMIN=  161385.
    T1MAX=  180286.##   T2MIN=   24885.##   T2MAX=   46215.##   S1MIN=   52228.##   S1MAX=   96996.##   S2MIN=   35811.
    S2MAX=   66505.##   ALPHA=       1.
```

SUMMARY OF INPUT AND OUTPUT VARIABLES FOR LINES A-J ARE:

A GIVEN: FIRST-TERM SEA BILLETS, CAREER SEA BILLETS,CAREER CONTINUATION RATE, AND FIRST-TERM RETENTION RATE
SOLVE FOR: FIRST-TERM SHORE BILLETS AND CAREER SHORE BILLETS

B GIVEN: CAREER SEA BILLETS, CAREER SHORE BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE
SOLVE FOR: FIRST-TERM SHORE BILLETS AND FIRST-TERM SEA BILLETS

C GIVEN: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE
SOLVE FOR: CAREER SEA BILLETS AND CAREER SHORE BILLETS

D GIVEN: FIRST-TERM SHORE BILLETS, TOTAL SEA BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE
SOLVE FOR: FIRST-TERM SEA BILLETS, CAREER SEA BILLETS AND CAREER SHORE BILLETS

E GIVEN: FIRST TERM SHORE BILLETS EQUAL TO ZERO, TOTAL SEA BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE
SOLVE FOR: FIRST-TERM SEA BILLETS, CAREER SEA BILLETS AND CAREER SHORE BILLETS

F GIVEN: TOTAL SEA BILLETS, TOTAL SHORE BILLETS, CAREER CONTINUATION RATE AND FIRST TERM RETENTION RATE
SOLVE FOR: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS, CAREER SHORE BILLETS AND CAREER SEA BILLETS

G GIVEN: CAREER SEA BILLETS, TOTAL FIRST-TERM BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE
SOLVE FOR: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS AND CAREER SHORE BILLETS

H GIVEN: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS, CAREER SEA BILLETS AND CAREER CONTINUATION RATE
SOLVE FOR: CAREER SHORE BILLETS AND FIRST-TERM RETENTION RATE

I GIVEN: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS, CAREER SEA BILLETS AND FIRST-TERM RETENTION RATE
SOLVE FOR: CAREER SHORE BILLETS AND CAREER CONTINUATION RATE

J GIVEN: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS, CAREER SEA BILLETS AND CAREER SHORE BILLETS
SOLVE FOR: FIRST-TERM RETENTION RATE AND CAREER CONTINUATION RATE

FIG. C-2: Sample Output - 9 User Specified Variables

SEA DUTY TOUR	SHORE DUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS		125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.0935
USER INPUTS		125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C 13.	8.	120407.	180385.	212697.	88095.	35550.	144835.	67862.	52545.	0.8600	0.0935
D 13.	8.	123737.	180373.	219447.	85663.	35550.	149823.	69624.	54113.	0.8600	0.0935
F 13.	8.	122554.	183601.	219447.	86708.	32036.	150765.	68682.	53872.	0.8600	0.0935
H 13.	8.	132364.	180385.	219447.	93322.	35550.	144835.	74612.	57772.	0.8600	0.1027
I 13.	8.	131273.	180385.	219447.	92211.	35550.	144835.	74612.	56661.	0.8716	0.0935
J 13.	8.	125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.9331	0.0466
USER INPUTS		125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C 13.	9.	120407.	180385.	208892.	91900.	35550.	144835.	64057.	56350.	0.8600	0.0935
D 13.	9.	125703.	180318.	219447.	94574.	35550.	152768.	66679.	59024.	0.8600	0.0935
F 13.	9.	122554.	183601.	219447.	86708.	28378.	155223.	64224.	58330.	0.8600	0.0935
H 13.	9.	140247.	180385.	219447.	101185.	35550.	144835.	74612.	65635.	0.8600	0.1088
I 13.	9.	138219.	180385.	219447.	99157.	35550.	144835.	74612.	63607.	0.8780	0.0935
USER INPUTS		125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C 13.	10.	120407.	180385.	205434.	95358.	35550.	144835.	60599.	59808.	0.8600	0.0935
D 13.	10.	127548.	191084.	219447.	99185.	35550.	155534.	63913.	63635.	0.8600	0.0935

FIG. C-2 (Continued)

SEA DUTY TOUR	SHORE DUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS		125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C 12.	8.	120407.	180385.	210663.	90129.	35550.	144835.	65828.	54579.	0.8600	0.0935
D 12.	8.	124774.	186927.	219447.	92254.	35550.	151377.	68070.	56704.	0.8600	0.0935
F 12.	8.	122553.	183602.	219447.	86708.	30516.	153086.	66361.	56192.	0.8600	0.0935
H 12.	8.	136473.	180385.	219447.	97411.	35550.	144835.	74612.	61861.	0.8600	0.1059
I 12.	8.	135004.	180385.	219447.	95942.	35550.	144835.	74612.	60392.	0.8751	0.0935
J 12.	8.	125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.9815	0.0129
USER INPUTS		125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C 12.	9.	120407.	180385.	206838.	93954.	35550.	144835.	62003.	58404.	0.8600	0.0935
B 12.	9.	126784.	189930.	219447.	97275.	35550.	154380.	65039.	61725.	0.8600	0.0935
F 12.	9.	122554.	183601.	219447.	86708.	28035.	155566.	61881.	60673.	0.8600	0.0935
USER INPUTS		125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C 12.	10.	120407.	180385.	203376.	97416.	35550.	144835.	58541.	61866.	0.8600	0.0935
B 12.	10.	128664.	192754.	219447.	101371.	35550.	157204.	62243.	66421.	0.8600	0.0935
USER INPUTS		125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C 12.	11.	120407.	180385.	200229.	100563.	35550.	144835.	55394.	65013.	0.8600	0.0935

FIG. C-2 (Continued)

	SEA DUTY TOUR	SHORE DUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C	13.	11.	120407.	180385.	202279.	98513.	35550.	144835.	57444.	62963.	0.8600	0.0935
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C	13.	12.	120407.	180385.	199392.	101406.	35550.	144835.	54557.	65850.	0.8600	0.0935
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	14.	8.	127200.	190562.	219447.	98315.	45727.	144835.	74612.	52588.	0.8600	0.0935
C	14.	8.	120407.	180385.	216537.	86255.	35550.	144835.	69702.	50705.	0.8600	0.0935
D	14.	8.	122612.	183918.	219447.	87353.	35550.	148438.	71009.	51803.	0.8600	0.0935
F	14.	8.	122553.	183802.	219447.	88708.	34952.	148650.	70797.	51756.	0.8600	0.0935
H	14.	8.	128889.	180385.	219447.	89027.	35550.	144835.	74612.	54277.	0.8600	0.1020
I	14.	8.	128089.	180385.	219447.	89027.	35550.	144835.	74612.	53477.	0.8684	0.0935
J	14.	8.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8936	0.0742
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C	14.	9.	120407.	180385.	210758.	90034.	35550.	144835.	65923.	54484.	0.8600	0.0935
D	14.	9.	124735.	186868.	219447.	92156.	35550.	151318.	68129.	56606.	0.8600	0.0935
F	14.	9.	122553.	183602.	219447.	88708.	30526.	153076.	66371.	56182.	0.8600	0.0935
H	14.	9.	136276.	180385.	219447.	97214.	35550.	144835.	74612.	61664.	0.8600	0.1058
I	14.	9.	134630.	180385.	219447.	95568.	35550.	144835.	74612.	60018.	0.8748	0.0935
J	14.	9.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.9634	0.0296

FIG. C-2 (Continued)

	SEA DUTY TOUR	SHORE DUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.6935
C	14.	10.	120467.	180385.	207311.	93481.	35550.	144835.	62476.	57931.	0.8600	0.6935
D	14.	10.	126546.	189583.	219447.	98682.	35550.	154033.	65414.	61132.	0.8600	0.6935
F	14.	10.	122554.	183601.	219447.	88708.	26408.	157193.	62254.	60300.	0.8600	0.6935
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.6935
C	14.	11.	120467.	180385.	204156.	96636.	35550.	144835.	59321.	61086.	0.8600	0.6935
D	14.	11.	120256.	192143.	219447.	100952.	35550.	156593.	62854.	65402.	0.8600	0.6935
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.6935
C	14.	12.	120467.	180385.	201259.	99533.	35550.	144835.	56424.	63923.	0.8600	0.6935
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.6935
A	15.	8.	124721.	186928.	219447.	92272.	42103.	144835.	74612.	50169.	0.8600	0.6935
B	15.	8.	125770.	188419.	225422.	88767.	37609.	150810.	74612.	51158.	0.8600	0.6935
C	15.	8.	120467.	180385.	216210.	84582.	35550.	144835.	71375.	49032.	0.8600	0.6935
D	15.	8.	121983.	182745.	219447.	85281.	35550.	147195.	72252.	49731.	0.8600	0.6935
F	15.	8.	122553.	183602.	219447.	88708.	36888.	146714.	72733.	49820.	0.8600	0.6935
H	15.	8.	125668.	188285.	219447.	88806.	35550.	144835.	74612.	51256.	0.8600	0.6977
I	15.	8.	125346.	180385.	219447.	88284.	35550.	144835.	74612.	50734.	0.8655	0.6935
J	15.	8.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8616	0.6969

FIG. C-2 (Continued)

	SEA DUTY TOUR	SHORE DUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C	15.	9.	120407.	180385.	212461.	88331.	35550.	144835.	67626.	52781.	0.8600	0.0935
D	15.	9.	123864.	185564.	219447.	85981.	35550.	150014.	69433.	54431.	0.8600	0.0935
F	15.	9.	122553.	183602.	219447.	88708.	32501.	151101.	68340.	54207.	0.8600	0.0935
H	15.	9.	132845.	180385.	219447.	92783.	35550.	144835.	74612.	58233.	0.8600	0.1031
I	15.	9.	131535.	180385.	219447.	92473.	35550.	144835.	74612.	56923.	0.8718	0.0935
J	15.	9.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.9280	0.0502
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C	15.	10.	120407.	180385.	209030.	91762.	35550.	144835.	64195.	56212.	0.8600	0.0935
D	15.	10.	125642.	188228.	219447.	94423.	35550.	152678.	66769.	58873.	0.8600	0.0935
F	15.	10.	122553.	183602.	219447.	88708.	28401.	155201.	64246.	58327.	0.8600	0.0935
H	15.	10.	139945.	180385.	219447.	100883.	35550.	144835.	74612.	65333.	0.8600	0.1086
I	15.	10.	137710.	180385.	219447.	98648.	35550.	144835.	74612.	63098.	0.8776	0.0935
J	15.	10.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.9052	0.0103
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C	15.	11.	120407.	180385.	205879.	94513.	35550.	144835.	61044.	59363.	0.8600	0.0935
B	15.	11.	127325.	190748.	219447.	98626.	35550.	155198.	64249.	63076.	0.8600	0.0935
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C	15.	12.	120407.	180385.	202978.	97614.	35550.	144835.	58143.	62264.	0.8600	0.0935

FIG. C-2 (Continued)

	SEA DUTY YOLF	SHORE DUTY YCUF	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.6935
A	16.	8.	122671.	182777.	219447.	87001.	38942.	144835.	74612.	48059.	0.8600	0.6935
C	16.	8.	120407.	180385.	217736.	83056.	35550.	144835.	72901.	47506.	0.8600	0.6935
D	16.	8.	121235.	181626.	219447.	89414.	35550.	146076.	73371.	47864.	0.8630	0.6935
F	16.	8.	122554.	183601.	219447.	88708.	38665.	144936.	74511.	48043.	0.8600	0.6935
H	16.	8.	123234.	180385.	219447.	84172.	35550.	144835.	74612.	48622.	0.8600	0.6956
I	16.	8.	122959.	180385.	219447.	87897.	35550.	144835.	74612.	48347.	0.8629	0.6935
J	16.	8.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.6956
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.6935
C	16.	9.	120407.	180385.	214020.	88772.	35550.	144835.	69185.	51222.	0.8600	0.6935
D	16.	9.	123077.	184384.	219447.	88014.	35550.	148834.	70613.	52464.	0.8600	0.6935
F	16.	9.	122553.	183602.	219447.	88708.	34322.	149280.	70167.	52386.	0.8600	0.6935
H	16.	9.	129852.	180385.	219447.	90790.	35550.	144835.	74612.	55240.	0.8600	0.7008
I	16.	9.	128845.	180385.	219447.	89783.	35550.	144835.	74612.	54233.	0.8692	0.6935
J	16.	9.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8924	0.6935
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.6935
C	16.	10.	120407.	180385.	210608.	90184.	35550.	144835.	65773.	54634.	0.8600	0.6935
D	16.	10.	124822.	186959.	219447.	92374.	35550.	151449.	67998.	56824.	0.8600	0.6935
F	16.	10.	122554.	183601.	219447.	88708.	30246.	153355.	66092.	56462.	0.8600	0.6935
H	16.	10.	136587.	180385.	219447.	97325.	35550.	144835.	74612.	61975.	0.8600	0.7060
I	16.	10.	134710.	180385.	219447.	95648.	35550.	144835.	74612.	60098.	0.8749	0.6935
J	16.	10.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.9536	0.0324
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.6935
C	16.	11.	120407.	180385.	207487.	92325.	35550.	144835.	62632.	57775.	0.8600	0.6935
D	16.	11.	126478.	189480.	219447.	96511.	35550.	153930.	65517.	60961.	0.8600	0.6935
F	16.	11.	122554.	183601.	219447.	88708.	26416.	157185.	62262.	60292.	0.8600	0.6935
I	16.	11.	140559.	180385.	219447.	101497.	35550.	144835.	74612.	65947.	0.8801	0.6935

FIG. C-2 (Continued)

	SEA DUTY TOUR	SHORE DUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C	16.	12.	120407.	180385.	204565.	92227.	35550.	144835.	59730.	60677.	0.8600	0.0935
D	16.	12.	128050.	191836.	219447.	100439.	35550.	156286.	63161.	64889.	0.8600	0.0935

FIG. C-2 (Continued)

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PROGRAM PARAMETERS:   T1= 146835.;;   T2=  35550.;;   S1=  74612.;;   S2=  51150.;;   C= 0.860000;;   R= 0.69345
   T1T2= 180385.;;   T1S1= 219447.;;   T2S2=  86700.;;   S1S2= 125770.;;   A=   3.0000;;   B=   2.000
   PERICD=       4.;;   EPS= 0.000100;;   SEATIN=       5.;;   SHOTIN=       5.;;   PERCEN= -1.0000;;   TIMIN=       0.
   T1MAX=99999999.;;   T2MIN=       0.;;   T2MAX=   50000.;;   S1MIN=       0.;;   S1MAX=99999999.;;   S2MIN=       0.
   S2MAX=   70000.;;   ALPHA=       1.
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SUMMARY OF INPUT AND OUTPUT VARIABLES FOR LINES A-J ARE:

A GIVEN: FIRST-TERM SEA BILLETS, CAREER SEA BILLETS, CAREER CONTINUATION RATE, AND FIRST-TERM RETENTION RATE
SOLVE FOR: FIRST-TERM SHORE BILLETS AND CAREER SHORE BILLETS

B GIVEN: CAREER SEA BILLETS, CAREER SHORE BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE
SOLVE FOR: FIRST-TERM SHORE BILLETS AND FIRST-TERM SEA BILLETS

C GIVEN: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE
SOLVE FOR: CAREER SEA BILLETS AND CAREER SHORE BILLETS

D GIVEN: FIRST-TERM SHORE BILLETS, TOTAL SEA BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE
SOLVE FOR: FIRST-TERM SEA BILLETS, CAREER SEA BILLETS AND CAREER SHORE BILLETS

E GIVEN: FIRST TERM SHORE BILLETS EQUAL TO ZERO, TOTAL SEA BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE
SOLVE FOR: FIRST-TERM SEA BILLETS, CAREER SEA BILLETS AND CAREER SHORE BILLETS

F GIVEN: TOTAL SEA BILLETS, TOTAL SHORE BILLETS, CAREER CONTINUATION RATE AND FIRST TERM RETENTION RATE
SOLVE FOR: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS, CAREER SHORE BILLETS AND CAREER SEA BILLETS

G GIVEN: CAREER SEA BILLETS, TOTAL FIRST-TERM BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE
SOLVE FOR: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS AND CAREER SHORE BILLETS

H GIVEN: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS, CAREER SEA BILLETS AND CAREER CONTINUATION RATE
SOLVE FOR: CAREER SHORE BILLETS AND FIRST-TERM RETENTION RATE

I GIVEN: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS, CAREER SEA BILLETS AND FIRST-TERM RETENTION RATE
SOLVE FOR: CAREER SHORE BILLETS AND CAREER CONTINUATION RATE

J GIVEN: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS, CAREER SEA BILLETS AND CAREER SHORE BILLETS
SOLVE FOR: FIRST-TERM RETENTION RATE AND CAREER CONTINUATION RATE

FIG. C-3: Sample Output - 11 User Specified Variables

	SEA DUTY TOUR	SHORE DUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C	12.	8.	120407.	180385.	210663.	90129.	35550.	144835.	65826.	54579.	0.8600	0.0935
D	12.	8.	124774.	186927.	219447.	92254.	35550.	151377.	68070.	56704.	0.8600	0.0935
E	12.	8.	109097.	163442.	219447.	53092.	0.	163442.	56005.	53092.	0.8600	0.0935
F	12.	8.	122553.	183602.	219447.	88708.	30516.	153086.	66361.	56192.	0.8600	0.0935
H	12.	8.	136473.	180385.	219447.	97411.	35550.	144835.	74612.	61861.	0.8600	0.1059
I	12.	8.	135004.	180385.	219447.	95942.	35550.	144835.	74612.	60392.	0.8751	0.0935
J	12.	8.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.9815	0.0129
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C	12.	9.	120407.	180385.	206838.	93954.	35550.	144835.	62003.	58404.	0.8600	0.0935
D	12.	9.	126784.	189938.	219447.	97275.	35550.	154388.	65059.	61725.	0.8600	0.0935
E	12.	9.	110979.	166261.	219447.	57793.	0.	166261.	53186.	57793.	0.8600	0.0935
F	12.	9.	122554.	183601.	219447.	88708.	26035.	157566.	61881.	60673.	0.8600	0.0935
I	12.	9.	142427.	180385.	219447.	103365.	35550.	144835.	74612.	67815.	0.8817	0.0935
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C	12.	10.	120407.	180385.	203376.	97416.	35550.	144835.	58541.	61866.	0.8600	0.0935
D	12.	10.	128664.	192754.	219447.	101971.	35550.	157204.	62243.	66421.	0.8600	0.0935
E	12.	10.	112739.	168858.	219447.	62190.	0.	168858.	50549.	62190.	0.8600	0.0935
F	12.	10.	122554.	183601.	219447.	88708.	21910.	161691.	57756.	64798.	0.8600	0.0935
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C	12.	11.	120407.	180385.	200229.	100563.	35550.	144835.	55394.	65013.	0.8600	0.0935
E	12.	11.	114388.	171368.	219447.	66309.	0.	171368.	48079.	66309.	0.8600	0.0935
F	12.	11.	122554.	183601.	219447.	88708.	18102.	165499.	53948.	68606.	0.8600	0.0935

FIG. C-3 (Continued)

SEA DUTY TOUR	SHORE DUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS		125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C 12.	12.	120407.	180385.	197358.	103434.	35550.	144835.	52523.	67884.	0.8600	0.0935
USER INPUTS		125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A 13.	8.	129999.	194755.	219447.	105307.	49920.	144835.	74612.	55387.	0.8600	0.0935
C 13.	8.	120407.	180385.	212697.	88095.	35550.	144835.	67862.	52545.	0.8600	0.0935
D 13.	8.	123737.	185373.	219447.	85663.	35550.	149823.	69624.	54113.	0.8600	0.0935
E 13.	8.	108245.	162163.	219447.	50561.	0.	162163.	57284.	50961.	0.8600	0.0935
F 13.	8.	122554.	183601.	219447.	88708.	32836.	150765.	68682.	53872.	0.8600	0.0935
H 13.	8.	132384.	180385.	219447.	92322.	35550.	144835.	74612.	57772.	0.8600	0.1027
I 13.	8.	131273.	180385.	219447.	92211.	35550.	144835.	74612.	56661.	0.8716	0.0935
J 13.	8.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.9331	0.0466
USER INPUTS		125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C 13.	9.	120407.	180385.	208892.	91500.	35550.	144835.	64057.	56350.	0.8600	0.0935
D 13.	9.	125703.	188318.	219447.	94574.	35550.	152768.	66679.	58024.	0.8600	0.0935
E 13.	9.	110095.	164937.	219447.	55585.	0.	164937.	54510.	55585.	0.8600	0.0935
F 13.	9.	122554.	183601.	219447.	88708.	28378.	155223.	64224.	58330.	0.8600	0.0935
H 13.	9.	140247.	180385.	219447.	101185.	35550.	144835.	74612.	65635.	0.8600	0.1068
I 13.	9.	138219.	180385.	219447.	99157.	35550.	144835.	74612.	63607.	0.8720	0.0935
USER INPUTS		125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C 13.	10.	120407.	180385.	205434.	95358.	35550.	144835.	60599.	59808.	0.8600	0.0935
D 13.	10.	117548.	191084.	219447.	95185.	35550.	155534.	63911.	61635.	0.8600	0.0935
E 13.	10.	111834.	167541.	219447.	59928.	0.	167541.	51906.	59928.	0.8600	0.0935
F 13.	10.	122554.	183601.	219447.	88708.	24251.	159350.	60097.	62457.	0.8600	0.0935

FIG. C-3 (Continued)

SEA DUTY TOUR	SHORE DUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS											
C 13.	11.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
D 13.	11.	120407.	180385.	202279.	98513.	35550.	144835.	57444.	62563.	0.8600	0.0935
E 13.	11.	129283.	193884.	219447.	103520.	35550.	158134.	61313.	67970.	0.8600	0.0935
F 13.	11.	113468.	169990.	219447.	84011.	0.	169990.	49457.	64011.	0.8600	0.0935
		122553.	183602.	219447.	88708.	20423.	163179.	56268.	66285.	0.8600	0.0935
USER INPUTS											
C 13.	12.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
E 13.	12.	120407.	180385.	199392.	101400.	35550.	144835.	54557.	65850.	0.8600	0.0935
F 13.	12.	115966.	172255.	219447.	67854.	0.	172295.	47152.	67854.	0.8600	0.0935
		122553.	183602.	219447.	88708.	16863.	166739.	52708.	69845.	0.8600	0.0935
USER INPUTS											
A 14.	8.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C 14.	8.	127200.	190562.	219447.	98315.	45727.	144835.	74612.	52588.	0.8600	0.0935
D 14.	8.	120407.	180385.	214537.	88259.	35550.	144835.	69702.	50705.	0.8600	0.0935
E 14.	8.	122812.	183988.	219447.	87353.	35550.	148438.	71009.	51803.	0.8600	0.0935
F 14.	8.	107483.	161024.	219447.	45060.	0.	161024.	58423.	49060.	0.8600	0.0935
H 14.	8.	122553.	183602.	219447.	88708.	34952.	148650.	70797.	51756.	0.8600	0.0935
I 14.	8.	128889.	180385.	219447.	85827.	35550.	144835.	74612.	54277.	0.8600	0.1000
J 14.	8.	128889.	180385.	219447.	85827.	35550.	144835.	74612.	53477.	0.8684	0.0935
		125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8936	0.0742
USER INPUTS											
C 14.	9.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
D 14.	9.	120407.	180385.	210758.	90034.	35550.	144835.	65923.	54484.	0.8600	0.0935
E 14.	9.	124735.	186868.	219447.	92156.	35550.	151318.	68129.	56606.	0.8600	0.0935
F 14.	9.	109304.	163752.	219447.	53609.	0.	163752.	55695.	53609.	0.8600	0.0935
H 14.	9.	122553.	183602.	219447.	88708.	30526.	153076.	66371.	56182.	0.8600	0.0935
I 14.	9.	136276.	180385.	219447.	57214.	35550.	144835.	74612.	61664.	0.8600	0.1050
J 14.	9.	134630.	180385.	219447.	95568.	35550.	144835.	74612.	60018.	0.8748	0.0935
		125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.9634	0.0256

FIG. C-3 (Continued)

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AGGREGATE SEA/SHORE ROTATION MODEL (MOSES).(U)
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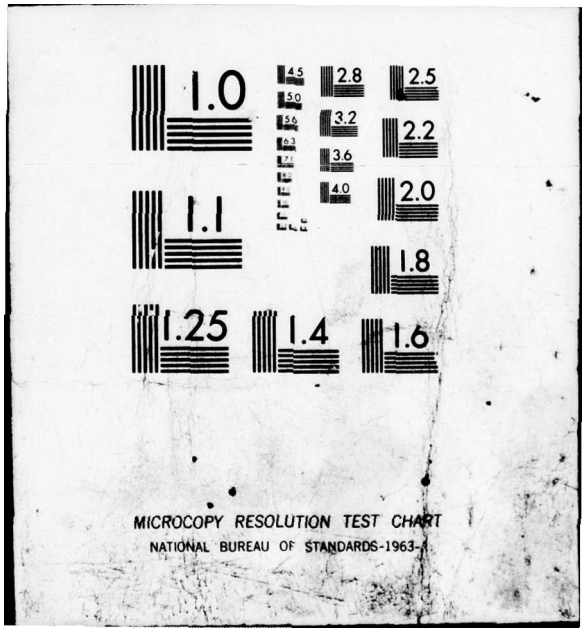
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

	SEA DUTY TOUR	SHORE DUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS			125770.	100365.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C	14.	10.	120467.	100365.	207311.	93481.	35550.	144835.	62476.	57931.	0.8600	0.0935
D	14.	10.	126546.	109583.	219447.	96682.	35550.	154033.	65414.	61132.	0.8600	0.0935
E	14.	10.	111020.	166322.	219447.	57095.	0.	166322.	53125.	57095.	0.8600	0.0935
F	14.	10.	122594.	183801.	219447.	88708.	26408.	157193.	62254.	60300.	0.8600	0.0935
H	14.	10.	143795.	100365.	219447.	104733.	35550.	144835.	74612.	69183.	0.8600	0.1116
I	14.	10.	141155.	100365.	219447.	102093.	35550.	144835.	74612.	66543.	0.8806	0.0935
USER INPUTS			125770.	100365.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C	14.	11.	120467.	100365.	204156.	88836.	35550.	144835.	59321.	61086.	0.8600	0.0935
D	14.	11.	128256.	192143.	219447.	100952.	35550.	156593.	62054.	65402.	0.8600	0.0935
E	14.	11.	112639.	168747.	219447.	61939.	0.	168747.	50700.	61939.	0.8600	0.0935
F	14.	11.	122553.	183602.	219447.	88708.	22571.	161631.	58616.	64137.	0.8600	0.0935
USER INPUTS			125770.	100365.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C	14.	12.	120407.	100365.	201259.	99533.	35550.	144835.	56424.	63983.	0.8600	0.0935
D	14.	12.	129870.	194561.	219447.	104984.	35550.	159011.	60436.	69434.	0.8600	0.0935
E	14.	12.	114167.	171037.	219447.	65757.	0.	171037.	48410.	65757.	0.8600	0.0935
F	14.	12.	122594.	183601.	219447.	88708.	18987.	164614.	54033.	67721.	0.8600	0.0935
USER INPUTS			125770.	100365.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	15.	8.	124781.	186938.	219447.	92272.	42103.	144835.	74612.	50169.	0.8600	0.0935
B	15.	8.	125776.	188419.	225422.	88767.	37609.	150810.	74612.	51158.	0.8600	0.0935
C	15.	8.	120407.	100365.	216216.	84582.	35550.	144835.	71375.	49032.	0.8600	0.0935
D	15.	8.	121983.	182745.	219447.	85281.	35550.	147195.	72252.	49731.	0.8600	0.0935
E	15.	8.	106801.	160001.	219447.	47355.	0.	160001.	59446.	47355.	0.8600	0.0935
F	15.	8.	122553.	183602.	219447.	88708.	16888.	166714.	72733.	49820.	0.8600	0.0935
H	15.	8.	125868.	100365.	219447.	88806.	35550.	144835.	74612.	51256.	0.8600	0.0977
I	15.	8.	125346.	100365.	219447.	88284.	35550.	144835.	74612.	50734.	0.8655	0.0935
J	15.	8.	125770.	100365.	219447.	88708.	35550.	144835.	74612.	51158.	0.8610	0.0969

FIG. C-3 (Continued)

	SEA DUTY TOUR	SHORE DUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C	15.	9.	120407.	180385.	212461.	88331.	35550.	144835.	67626.	52781.	0.8600	0.0935
D	15.	9.	123864.	185564.	219447.	85581.	35550.	150014.	69433.	54431.	0.8600	0.0935
E	15.	9.	108592.	162685.	219447.	51830.	0.	162685.	56762.	51830.	0.8630	0.0935
F	15.	9.	122553.	183602.	219447.	88708.	32501.	151101.	68346.	54207.	0.8600	0.0935
H	15.	9.	132845.	180385.	219447.	92783.	35550.	144835.	74612.	58233.	0.8600	0.1031
I	15.	9.	131535.	180385.	219447.	92473.	35550.	144835.	74612.	56923.	0.8710	0.0935
J	15.	9.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.9220	0.0502
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C	15.	10.	120407.	180385.	209030.	91762.	35550.	144835.	64195.	56212.	0.8600	0.0935
D	15.	10.	125642.	180228.	219447.	94423.	35550.	152670.	66769.	58873.	0.8600	0.0935
E	15.	10.	110285.	165222.	219447.	56060.	0.	165222.	54225.	56060.	0.8600	0.0935
F	15.	10.	122553.	183602.	219447.	88708.	28401.	155201.	64246.	58307.	0.8600	0.0935
H	15.	10.	139945.	180385.	219447.	109883.	35550.	144835.	74612.	65333.	0.8600	0.1086
I	15.	10.	137710.	180385.	219447.	96648.	35550.	144835.	74612.	63098.	0.8776	0.0935
J	15.	10.	125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.9852	0.0193
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C	15.	11.	120407.	180385.	203879.	94913.	35550.	144835.	61044.	59383.	0.8600	0.0935
D	15.	11.	127325.	190748.	219447.	96626.	35550.	155198.	66269.	63076.	0.8600	0.0935
E	15.	11.	111888.	167622.	219447.	60063.	0.	167622.	51825.	60063.	0.8690	0.0935
F	15.	11.	122554.	183601.	219447.	88708.	24563.	159338.	60469.	62145.	0.8600	0.0935
I	15.	11.	143866.	180385.	219447.	104804.	35550.	144835.	74612.	69254.	0.8828	0.0935
USER INPUTS			125770.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C	15.	12.	120407.	180385.	202978.	97814.	35550.	144835.	58143.	62264.	0.8600	0.0935
D	15.	12.	128518.	193139.	219447.	102606.	35550.	157585.	61862.	67056.	0.8600	0.0935
E	15.	12.	113409.	169895.	219447.	63853.	0.	169895.	49551.	63853.	0.8600	0.0935
F	15.	12.	122554.	183601.	219447.	88708.	20966.	162635.	56812.	65742.	0.8600	0.0935

FIG. C-3 (Continued)

	SEA DUTY TOUR	SHORE DUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS			125770.	100365.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	16.	8.	122671.	103777.	219447.	87001.	38942.	144835.	74612.	48059.	0.8600	0.0935
B	16.	8.	125770.	100419.	226168.	76021.	24863.	163556.	74612.	51158.	0.8600	0.0935
C	16.	8.	120407.	100365.	217736.	82056.	35550.	144835.	72901.	47506.	0.8600	0.0935
D	16.	8.	121235.	101626.	219447.	87814.	35550.	146676.	73371.	47864.	0.8620	0.0935
E	16.	8.	106186.	155080.	219447.	41819.	C.	159080.	60367.	45819.	0.8600	0.0935
F	16.	8.	122554.	103601.	219447.	88708.	38665.	144936.	74511.	48043.	0.8600	0.0935
G	16.	8.	120407.	100365.	205771.	93021.	49226.	131159.	74612.	45795.	0.8600	0.0935
H	16.	8.	123234.	100365.	219447.	84172.	35550.	144835.	74612.	48622.	0.8630	0.0956
I	16.	8.	122959.	100365.	219447.	87897.	35550.	144835.	74612.	48347.	0.8629	0.0935
J	16.	8.	125770.	100365.	219447.	88708.	35550.	144835.	74612.	51158.	0.8340	0.1158
USER INPUTS			125770.	100365.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
A	16.	9.	127771.	101418.	219447.	99742.	46583.	144835.	74612.	53159.	0.8600	0.0935
C	16.	9.	120407.	100365.	214020.	88772.	35550.	144835.	69185.	51222.	0.8600	0.0935
D	16.	9.	123077.	104384.	219447.	88614.	35550.	148834.	70613.	52464.	0.8600	0.0935
E	16.	9.	107949.	101721.	219447.	90223.	0.	161721.	57726.	50223.	0.8600	0.0935
F	16.	9.	122553.	103602.	219447.	88708.	34322.	149209.	70167.	52586.	0.8600	0.0935
G	16.	9.	129852.	100365.	219447.	90790.	35550.	144835.	74612.	55240.	0.8600	0.1008
H	16.	9.	120843.	100365.	219447.	85783.	35550.	144835.	74612.	54233.	0.8692	0.0935
J	16.	9.	125770.	100365.	219447.	88708.	35550.	144835.	74612.	51158.	0.8984	0.0739
USER INPUTS			125770.	100365.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C	16.	10.	120407.	100365.	210608.	90184.	35550.	144835.	65773.	54634.	0.8600	0.0935
D	16.	10.	124822.	100999.	219447.	92374.	35550.	151449.	67998.	56824.	0.8600	0.0935
E	16.	10.	109620.	164224.	219447.	54397.	0.	164224.	55223.	54397.	0.8690	0.0935
F	16.	10.	122554.	103601.	219447.	88708.	30246.	153355.	66092.	56462.	0.8620	0.0935
G	16.	10.	136587.	100365.	219447.	97525.	35550.	144835.	74612.	61975.	0.8600	0.1060
H	16.	10.	134718.	100365.	219447.	95648.	35550.	144835.	74612.	60098.	0.8749	0.0935
J	16.	10.	125770.	100365.	219447.	88708.	35550.	144835.	74612.	51158.	0.9536	0.0324
USER INPUTS			125770.	100365.	219447.	88708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C	16.	11.	120407.	100365.	207467.	92325.	35550.	144835.	62632.	57775.	0.8600	0.0935
D	16.	11.	126478.	109480.	219447.	98511.	35550.	153930.	65517.	60961.	0.8600	0.0935
E	16.	11.	111265.	166599.	219447.	52357.	0.	166599.	52848.	58357.	0.8630	0.0935
F	16.	11.	122554.	103601.	219447.	88708.	26416.	157185.	62262.	60292.	0.8600	0.0935
G	16.	11.	143439.	100365.	219447.	104377.	35550.	144835.	74612.	68827.	0.8600	0.1113
H	16.	11.	140599.	100365.	219447.	101497.	35550.	144835.	74612.	65947.	0.8861	0.0935

FIG. C-3 (Continued)

	SEA DUTY TOUR	SHORE DUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS			125770.	18C3E5.	219447.	8E708.	33550.	144833.	74612.	51158.	0.8600	0.C935
C	16.	12.	12E467.	18E3E5.	2C4365.	9E227.	33550.	144835.	59730.	60677.	0.86C0	0.C935
D	16.	12.	128056.	191E36.	219447.	100439.	33590.	156286.	63161.	64089.	0.8600	0.3935
E	16.	12.	112710.	160E54.	219447.	62117.	0.	160854.	55593.	62117.	0.8600	0.C935
F	16.	12.	122554.	183601.	219447.	8E708.	22812.	160789.	58658.	63896.	0.8600	0.C935

FIG. C-3 (Continued)

APPENDIX D

THE MODEL

The aggregate model is based on a simplified description of the sea/shore rotation process. Enlisted personnel are divided into two experience categories: first-term personnel who have finished preliminary training and are serving their first sea or shore duty tour, and career personnel who have completed their first duty tour. We consider two types of duty, sea and shore. At the end of their first tour, personnel who continue in the Navy are assigned to the other type of duty. Thereafter, if they stay in the Navy, they are rotated at the end of each tour to the other type of duty. This rotation is described by the respective lengths of the career sea and career shore tours, a:b. This process is represented in figure D-1.

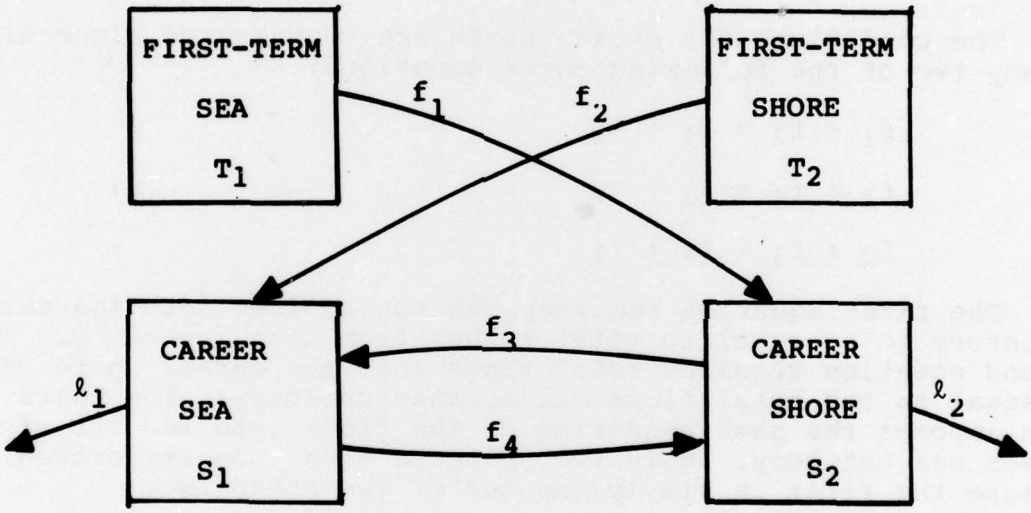

FIG. D-1: FLOW DIAGRAM

The rectangles represent the four experience duty categories and the arrows represent associated flows. The arrows labeled f_1, f_2, f_3 and f_4 represent continuing personnel transferred to the other type of duty. The arrows labeled ℓ_1 and ℓ_2 represent losses from the career force.

When flows into and out of each category are equal the number of personnel in each category remains the same. This condition is called a balanced system. In a balanced system the flows are determined by continuation behavior and the lengths of the duty tours. There is a static distribution of personnel (T_1, T_2, S_1, S_2) which results from particular continuation and rotation in a balanced system. This distribution gives the actual numbers of personnel which will be at each of the four categories if the specified continuation behavior is realized and the rotation pattern is followed. Billet requirements express the numbers of job assignments, or spaces, which are planned for each of the categories. Our model represents the relation between rotation patterns a:b, personnel distribution (T_1, T_2, S_1, S_2), and continuation behavior. The personnel distribution can then be compared with the billet requirements.

The conditions for steady state are represented algebraically by any two of the following three equations:

$$f_1 + f_2 = \ell_1 + \ell_2$$

$$f_1 + f_4 = f_3 + \ell_2 \qquad (1)$$

$$f_2 + f_3 = f_4 + \ell_1$$

The first equation requires the total flows into the career inventory to be equal to total losses from that inventory. The second equation requires total flows into the career shore category be equal to the total flows out of that category. The third equation imposes the same condition on the flows into and out of the career sea category. Only two of these equations are needed because the first is simply the sum of the other two.

The transition behavior of first-term personnel is represented by a single parameter, r, which is the ratio of the per period flow of personnel into the career force to the total number of personnel serving their first tour. Continuation behavior for the career categories is represented by an average continuation rate, c, which is the proportion of the career personnel which are retained for one period. The computation of these parameters from the more familiar length of service continuation rates is discussed in appendix A. The formulation of the model presented in this paper assumes that the first tour for personnel assigned to sea and shore duty occurs at the same time in their career and that continuation rates are the same at both sea and shore duty. These assumptions are not essential to the analysis but make it simpler.

Using the average continuation rate c the flows of career personnel from period to period are represented in figure D-2. The horizontal arrows represent flows continuing in the Navy and the arrows pointing down represent losses. By this reasoning we see that if the per period flow into one of the career categories is f and the tour for that category is b periods, then the period flow of personnel who are transferred to the other type of duty after completing the assigned tour is $c^b f$. Since total outflows equal the inflow, losses are $(1 - c^b)f$. Applying these relations to both sea and shore categories gives the following relations:

$$f_4 = c^a(f_2 + f_3) = c^a(f_4 + \ell_1)$$

$$f_3 = c^b(f_1 + f_4) = c^b(f_3 + \ell_2).$$

Rearranging gives

$$f_4 = \frac{c^a}{1 - c^a}\,\ell_1 \qquad (2)$$

$$f_3 = \frac{c^b}{1 - c^b}\,\ell_2.$$

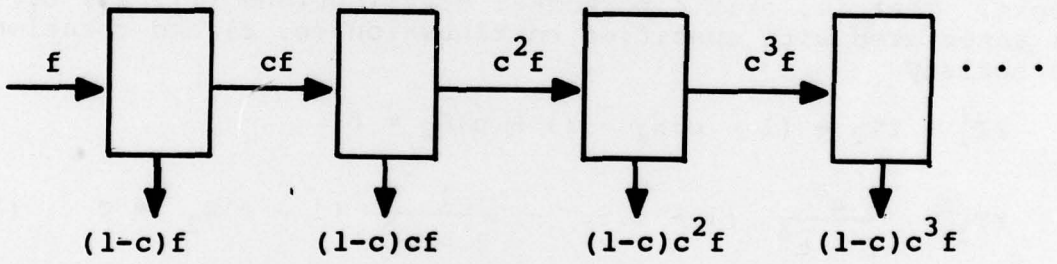

FIG. D-2: CAREER PERSONNEL FLOWS

These relations allow us to eliminate two of the variables in our balance conditions (1) by substitution. The balance conditions become:

$$f_1 + f_2 - \ell_1 - \ell_2 = 0$$

$$f_1 + \frac{c^a}{1 - c^a}\ \ell_1 - \frac{1}{1 - c^b}\ \ell_2 = 0 \qquad (3)$$

$$f_2 + \frac{c^b}{1 - c^b}\ \ell_2 - \frac{1}{1 - c^a}\ \ell_1 = 0.$$

These conditions relate four flows (f_1, f_2, ℓ_1, ℓ_2) to the career continuation rate c and the sea/shore rotation pattern a:b. We are interested in the distribution of personnel, that is, the stocks which are determined by these flows. Since

$$\ell_1 = (1 - c)S_1$$

$$\ell_2 = (1 - c)S_2 \qquad (4)$$

$$f_1 = rT_1$$

$$f_2 = rT_2$$

we can rewrite the conditions in terms of stocks -- steady state stocks. That is, static personnel distributions (T_1, T_2, S_1, S_2) associated with specified continuation (c, r) and rotation a:b satisfy

$$rT_1 + rT_2 - (1 - c)S_1 - (1 - c)S_2 = 0$$

$$rT_1 + \frac{c^a}{1 - c^a}\ (1 - c)S_1 - \frac{1}{1 - c^b}\ (1 - c)S_2 = 0 \qquad (5)$$

$$rT_2 + \frac{c^b}{1 - c^b}\ (1 - c)S_2 - \frac{1}{1 - c^a}\ (1 - c)S_1 = 0\ .$$

These conditions can be used to determine the balanced systems associated with particular rotation patterns. On the other hand, if a particular balanced system is desired these conditions can be used to determine what rotation pattern, or patterns, if any, will produce that distribution. As before, any two of the conditions imply the third. Therefore, we consider the model to be defined by the first two conditions:

$$r(T_1 + T_2) - (1 - c)(S_1 + S_2) = 0 \qquad (6)$$

$$rT_1 + c^a \left(\frac{1 - c}{1 - c^a}\right) S_1 - \left(\frac{1 - c}{1 - c^b}\right) S_2 = 0. \qquad (7)$$

The analysis of the model consists of a description of the interrelationships these equations impose on S_1, S_2, T_1, T_2, a, b, c, and r. For instance, when a rotation pattern a:b and continuation behavior (c, r) are fixed, the components S_i, T_i (i =1, 2) are linearly dependent, and any two can be solved for in terms of the other two. For example, given the sea billet structure, the problem of determining the number of shore billets needed for rotation exploits this linearity.

Another linear aspect of the model is equation (6), interpreted graphically as the diagonal line segment in figure D-3. The r-intercept is determined by the ratio $R=(S_1 + S_2)/(T_1 + T_2)$ of career to first-term personnel. The points (c, r) on the segment represent continuation behavior for which equation (6) is satisfied. This equation has the following interpretation: if the input to the first-term force is the same each period (i.e., $T_1 + T_2$ is in a steady state), then equation (6) is the condition which must be satisfied if the total career force $S_1 + S_2$ is also to be in a steady state. If we set c=1 in equation (6) then r=0, and so the c-intercept is always at (1, 0). If continuation behavior $(c, r) \neq (1, 0)$ is specified, the value of R is completely determined by linearity. Therefore, only a billet structure for which the ratio of career billets to first-term billets is R can be filled in a first-term to career steady state with this continuation behavior.

Theoretically the values of c and r may vary between 0 and 1; however, the real world imposes practical restrictions. For example, because of attrition due to retirement, c cannot assume

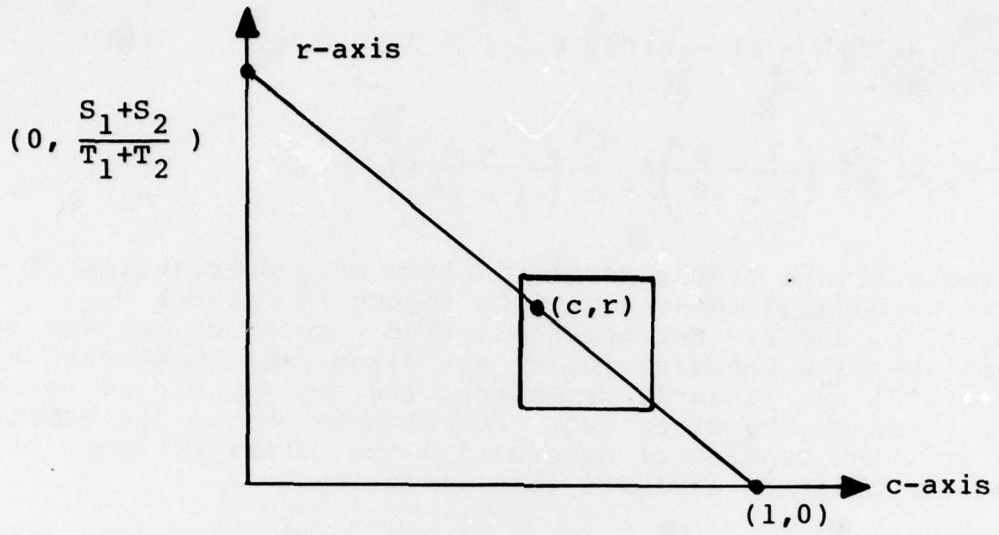

FIG. D-3: GRAPHICAL REPRESENTATION OF TOTAL FORCE STABILITY

a value too close to 1. Although the values of c and r may be affected to some extent by incentives, such as a reenlistment bonus or sea pay, the Navy cannot systematically alter them much beyond their observed values. These real world limits are indicated in the figure by a rectangular attainable region; in practice (c, r) is constrained to lie within this area. Since the first-term to career steady state systems which can be achieved are then represented by lines passing through this rectangle, the limitations on the variability of (c, r) place upper and lower bounds on R. The billet managers in Op-01 must be aware of these bounds in order to be sure that planned billet structures are feasible with respect to present continuation behavior. For example, if the line segment in figure D-3 represents the present career to first-term ratio of 125770/180385, then the point (0.86, 0.09345) corresponding to current continuation[1] is found to lie well below the line. Therefore, either this ratio must be decreased or c or r increased if a steady state force is desired.

On the other hand, if the billet structure S_i, T_i (i=1, 2) is prescribed, then by (6) r is completely determined from c. The relations between a, b, and c as expressed in equation (7) are non-

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[1]Center for Naval Analyses, Memorandum (CNA)78-0226, "Sea-Shore Rotation Model, Briefing to the Advisory Committee", by Lt. John Waterman, USN, and LaVar Huntzinger, Unclassified, 23 Feb 1978.

linear and therefore more difficult to describe. The Navy's interest in finding an equitable rotation policy while filling required billets illustrates the importance of considering this aspect of the model. The purpose of the remaining paragraphs of this appendix is to describe the nature of the constraints on a, b, and c imposed by equation (7). In order to simplify the discussion, we assume that all rotation patterns satisfy the condition $a, b \geq 1$. This is a technical restriction. However, since personnel are not normally assigned to tours or less than one year's duration, and the periods of interest are years or quarters, this will always hold.

In order to express the connections between continuation and rotation, we eliminate r between equations (6) and (7) as follows. If equation (6) is multiplied by T_1 and equation (7) by $(T_1 + T_2)$ they become

$$rT_1(T_1 + T_2) = (1 - c)(S_1 + S_2)T_1$$

$$rT_1(T_1 + T_2) = (1 - c)\left[\left(\frac{1}{1-c^b}\right) S_2 - \left(\frac{c^a}{1-c^a}\right) S_1\right] (T_1 + T_2).$$

Since $1 - c \neq 0$, equating the expressions on the righthand side gives

$$(S_1 + S_2)T_1 = \left[\left(\frac{1}{1-c^b}\right) S_2 - \left(\frac{c^a}{1-c^a}\right) S_1\right] (T_1 + T_2).$$

This reduces to an equivalent relation $f_{a:b}(c) = 0$, where $f_{a:b}$ is the polynomial

$$f_{a:b}(x) = (S_1T_2 - S_2T_1)x^{a+b} - (S_1T_2 + S_2T_2)x^a + (S_1T_1 + S_2T_1)x^b + (S_2T_2 - S_1T_1) .$$

Since a fixed billet structure has been assumed, these polynomials are parameterized by the rotation pattern a:b. For given a:b the solutions c of

$$f_{a:b}(x) = 0 \qquad 0 < x < 1 \tag{8}$$

represent values of the continuation rate which are consistent with a balanced system with an a:b rotation pattern. However, it

should be emphasized that a choice of a, b and c which satisfies equation (8) will provide a solution to the model only if r is determined so that it satisfies equation (6). The graphs of $y = f_{a:b}(x)$ for several rotation patterns a:b are sketched in figure D-4. For these graphs it has been assumed, as is the present case for the total Navy, that $S_1T_1 > S_2T_2$; if this inequality were reversed, the graphs would be reflected about the x axis.

In order to study the solutions of equation (8), note that $f_{a:b}(c) = 0$ is equivalent to the simultaneous system

$$(S_1T_2 - S_2T_1)xy - (S_1T_2 + S_2T_2)y + (S_1T_1 + S_2T_1)x + S_2T_2 - S_1T_1 = 0 \qquad (9)$$

$$y = x^{a/b},$$

where $x = c^b$.

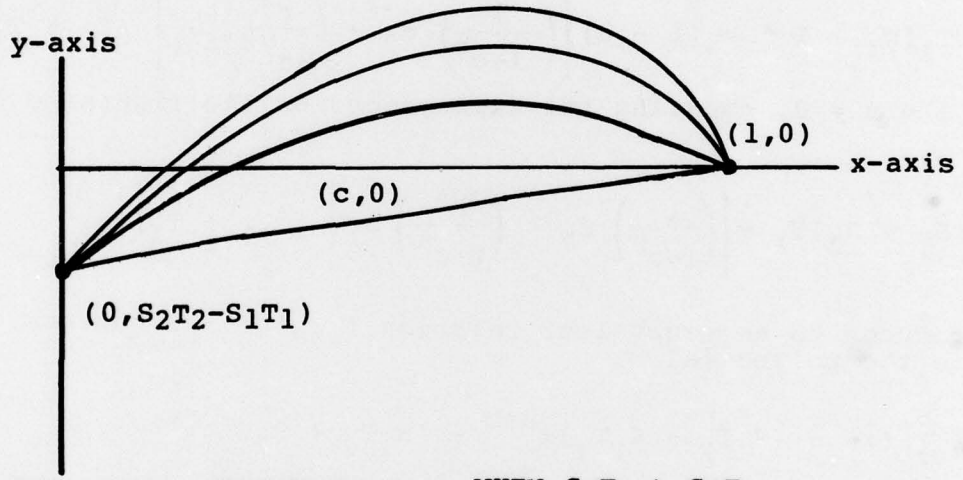

FIG. D-4: GRAPHS OF $f_{a:b}$ WHEN $S_1T_1 > S_2T_2$

The curve represented by the first of these equations is a hyperbola; hence the arc between any two points on it is convex. This curve passes through the point (1,1) and is independent of a:b. The hyperbola is degenerate (i.e., y=x) if $S_1 = S_2$ and $T_1 = T_2$. In this case we shall say that the system is degenerate. By implicit differentiation,

$$\left(\left(S_1T_2 + S_2T_2\right) - \left(S_1T_2 - S_2T_1\right) x\right) \frac{dy}{dx} = \left(S_1T_2 - S_2T_1\right) y + S_1T_1 + S_2T_1 \quad .$$

In particular, at (1,1) $dy/dx = S_1/S_2 > 0$.

In order to simplify notation, define

$$d = \begin{cases} (S_1T_1 - S_2T_2)/(S_1T_1 + S_2T_1) & \text{if } S_1T_1 > S_2T_2 \\ 0 & \text{if } S_1 = S_2 \text{ and } T_1 = T_2 \\ 1 & \text{if } S_1T_1 = S_2T_2 \text{ but } T_1 \neq T_2 \\ (S_2T_2 - S_1T_1)/(S_2T_2 + S_1T_2) & \text{if } S_1T_1 < S_2T_2 \end{cases}$$

then $0 \leq d \leq 1$. Suppose, for instance, that $S_2T_2 > S_1T_1$, then the conic passes through the point P = (0,d) on the positive y-intercept, and the arc between P and (1,1) represents a continuous single-valued convex function, h(x). Moreover, this function is monotonically increasing on $0 < x < 1$ for h(x)=0 is part of a hyperbola whose asymptotes are parallel to the coordinate axes.

Clearly, $h'(1) = S_1/S_2$. Now $y = x^{a/b}$ also defines a convex arc between (0,0) and (1,1). It is monotonically increasing on $0 < x < 1$, and the derivative at (1,1) is a/b. By the convexity, it follows that these two arcs can have at most one intersection over $0 < x < 1$, and such an intersection will occur if and only if $a/b < S_1/S_2$. Also, the y-coordinate of this point of intersection must satisfy $d < y < 1$; that is $d^{1/a} < c < 1$. If c satisfies this inequality then there is exactly one b such that $f_{a;b}(c) = 0$, for the point of intersection starts at (1,1) when $a/b = S_1/S_2$ and tends monotonically to P as b $+\infty$ (it is clear from this that the strict inequality is necessary).

Now consider the non-degenerate case in which $S_2T_2 = S_1T_2$. Hence the arc h(x) now passes through (0,0) and (1,1), convexity arguments similar to the preceding ones show that there can be no non-trivial intersections unless a/b is between 1 and S_1/S_2; and if this condition holds, then there is exactly one intersection. However, in the degenerate case, the convexity of $y = x^{a/b}$ (where $a \neq b$) implies that there can be no non-trivial intersections; but if a = b, then the two arc coincide.

The model possesses a certain symmetry, already noted in the derivation of equations (6) and (7). A moment's consideration of the diagram in figure D-1 will show that our analysis can be applied to the case $S_2T_2 < S_1T_1$ by simply replacing (S_1, S_2, T_1, T_2, a, b) with (S_2, S_1, T_2, T_1, b, a) throughout. These results can be summarized in the following "existence" theorem.

Theorem (1) Suppose $S_2T_2 > S_1T_1$. Then the polynomial equation
$f_{a:b}(x) = 0$
has a solution c with $0 < c < 1$ if and only if $a/b < S_1/S_2$, and in this case $d^{\frac{1}{a}} < c < 1$. Conversely, if c lies in $d^{\frac{1}{a}} < c < 1$, then there is a unique b for which $f_{a:b}(c) = 0$.

(2) Suppose $S_2T_2 < S_1T_1$. Then the polynomial equation has a solution if and only if $a/b > S_1/S_2$, and in this case $d^{\frac{1}{b}} < c < 1$. For any c in $d^{\frac{1}{b}} < c < 1$ there is a unique a such that $f_{a:b}(c) = 0$.

(3) Suppose the system is non-degenerate and $S_1T_1 = S_2T_2$. Then the equation has a solution if and only if ab is strictly between 1 and S_1/S_2. If c lies in $0 < c < 1$, then for any a there is a unique b such that $f_{a:b}(c) = 0$, and given b there is a unique a such that this equation is satisfied.

(4) Suppose the system is degenerate. Then the equation has a solution if and only if $S_2 = S_1$, $T_2 = T_1$ and $a = b$. In this case $f_{a:a}(x) = 0$ identically for all positive a.

These separate cases must be considered when actually solving the model for a balanced system. We will now assume that $S_2T_2 \leq S_1T_1$ since this is consistent with the total Navy as it is presently constituted. However, not all communities within the Navy satisfy this condition, and so the other cases are also important.

The theorem shows that it is not possible to attain a steady state with any rotation pattern unless the continuation rate c satifies the inequality $d < c < 1$. On the other hand, if c is in this interval (assuming $S_2T_2 \leq S_1T_1$) there exist values of b such that

$d^{\frac{1}{b}} < c < 1$. Using logarithms, the equation $f_{a:b}(c) = 0$ can be solved for a unique a. Thus, the model has a solution if and only if $d < c < 1$. Fractional solutions for a:b are possible. For example, given a particular annual continuation rate c we might find that equation (8) was satisfied with a = 11/4 and b = 13/4. This can be interpreted as a quarterly rotation pattern of 11:13 corresponding to a quarterly continuation rate of $c^{1/4}$.

If the rotation pattern a:b is given, then equation (8) can be solved for c using an approximation technique such as Newton's method. According to the analysis there is at most one solution in the interval $0 < x < 1$.

The graphical interpretation of equation (6) can now be extended to represent the entire model, including the relationship between continuation and rotation. This is indicated in figure D-5.

As before, (c,r) pairs on the diagonal represent the only possible continuation behaviors consistent with a first-term to career steady state force. The solid segment of the diagonal is determined, as shown, by d, which depends only on the billet structure, and lies in the interval $0 \leq d \leq 1$. Points on this segment represent continuation behavior for which balanced systems exist. Thus (c',r') represents an attainable continuation; and although it is consistent with a steady state force, there is no associated rotation pattern for which each of the components S_i, T_i (i = 1,2) would also remain in a steady state.

When the system is degenerate, the situation is different. For any continuation c the rotation patterns are exactly the a:a patterns for all $a > 0$.

The rectangle in figure D-5 is the attainable region for (c,r)pairs. Points such as (c",r") represent continuation behavior which is consistent with a steady state billet structure for some rotation pattern; but they are not practical since they are beyond the attainable region. The only useful solutions to the model are those (c,r) pairs which lie on the solid segment but within the rectangular region.

It is clear that in figure D-5, the first-term transition rate r must satisfy the inequality $r < S_2/T_1$. Thus, the billet structure also imposes an absolute upper bound on first-term transition rates in a balanced system.

Finally, if the billet structure is allowed to vary, then d will also vary. Therefore the billet structures for which the model has a feasible solution are just those for which the solid segment, determined by d and the ratio R, intersects the attainable region.

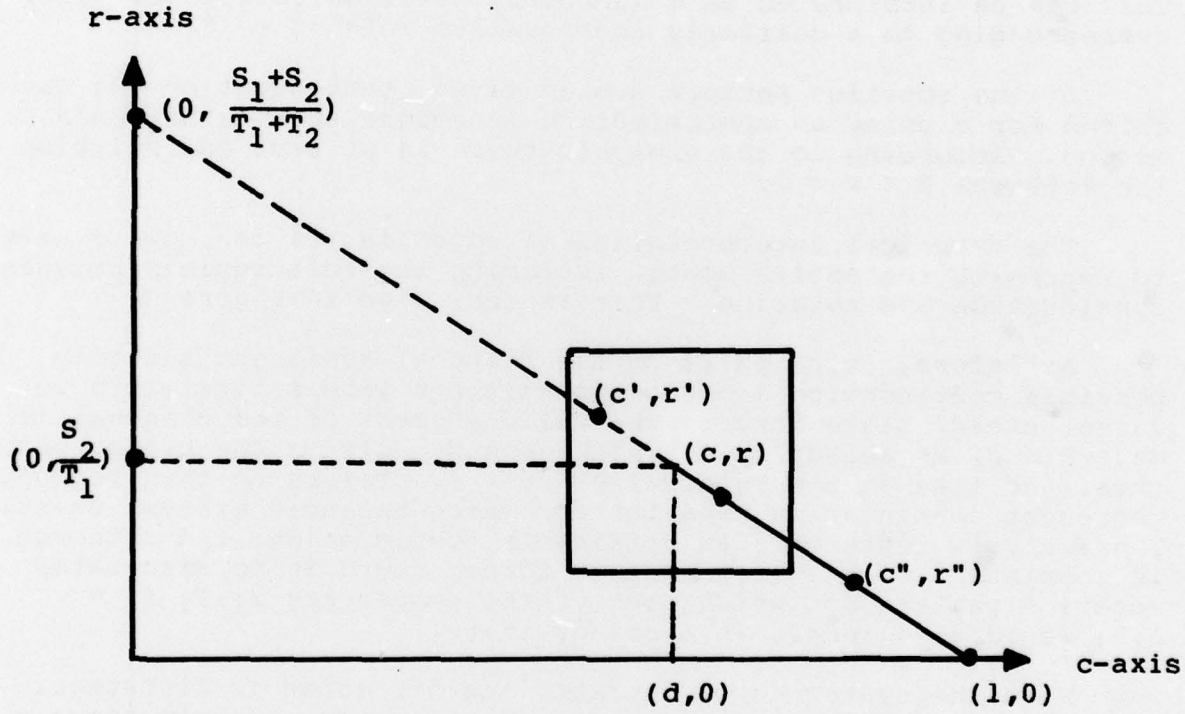

FIG. D-5: GRAPHICAL INTERPRETATION OF THE SEA/SHORE MODEL WHEN $S_1T_1 \geq S_2T_2$